313150

JPRS-UEE-84-014

15 October 1984

DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

DTIC QUALITY INSPECTED 4

19980325 144

FBIS FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

3
67
A04

JPRS-UEE-84-014

15 OCTOBER 1984

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

Soviet books and journal articles displaying a copyright notice are reproduced and sold by NTIS with permission of the copyright agency of the Soviet Union. Permission for further reproduction must be obtained from copyright owner.

JPRS-UEE-84-014

15 October 1984

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

CONTENTS

ANTENNAS AND PROPAGATION

Measurement of Snow Cover Thickness by Radar Sounding
(V.V. Bogorodskiy, V. I. Poznyak; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 1

Diffraction of Plane Electromagnetic Waves on Semiinfinite Grid of Parallel Conductors Arranged at an Angle to its Edge
(V. A. Rozov, S. A. Tret'yakov; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 1

Rules for Post-Detector Detection of Weak Signals in Non-Gaussian Noise of Unknown Power
(Ya. Yu. Nikitin, R. P. Filimonov; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 2

Minimization of Anomalous Errors in Measuring Systems Employing Search and Testing Devices
(V.M. Katikov; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 2

Possibility of Realization of Highly-Directional Antenna Arrays
(V. A. Pavlyuk, T. A. Sigona, et al.; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 3

Measurement of Main Parameters of RT-70 Antenna
(A. M. Aslanyan, A. G. Gulyan, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 3

Two-Dimensional Open Resonators with Cylindrical Mirrors
(V. N. Koshparenok, P. N. Melezhik, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 4

Diffraction of Electromagnetic Waves on Grid of Cylindrical Semiconducting Rods in Flat Dielectric Layer
(V. A. Kaplun, V. G. Kulish; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 4

Scattering of Radio Waves on Magnetized Meteor Trail
(V. V. Sidorov, R. G. Khuzyashev; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 5

Electromagnetic Energy Flux Lines Near Half-Plane
(V. P. Nefedov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 5

CIRCUITS AND SYSTEMS

Selection of Longitudinal Lower-Types of Oscillations of Open Millimeter-Band Resonator by Elongated Resonant Heterogeneities
(B. M. Mulgakov, V. N. Skresanov, et al.; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 6

Disruption of Quasi-Periodic Movement Caused by Doubling and Stochasticity in a System of Oscillators
(V. S. Anishchenko, T. Ye. Letchford, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 6

Synchronization and Randomization of Ensemble of Feedback Oscillators by External Noise
(A. S. Pikovskiy; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 7

Compensation of Phase Distortion of Wave Fields with Help of Irregular Periodic Diffraction Structures
(A. A. Kurayev, L. N. Kluk, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 8

COMPUTERS

Use of Functional Diagnosis Devices in Struggle with After-effects of Failures of Microprocessor Relay Protection Systems
(V. K. Gemst, V. R. Roganov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 5, May 84)..... 9

Assurance of Reliability of Relay Protection Microprocessor Devices
(A.P. Fomchenkov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 3, Mar 84)..... 9

ELECTROMAGNETIC COMPATABILITY

Simplified Equation for Calculation of Electromagnetic Fields in Thin Cylindrical Layers
(I.M. Grach, M.N. Fayde; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 3, Mar 84)..... 11

ELECTRON DEVICES

Fundamental Energy Losses in Quartz Crystals in $4 \cdot 10^4$-$1.8 \cdot 10^9$ Hz Frequency Range
(A. G. Smagin: RADIOTEKHNIKA I ELEKTRONIKA, No 5, 5 May 84)..... 12

New Class of Semiconductor Diodes
(Kh. I. Amirkhanov, R. I. Bashirov, et al.; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 12

Optoelectronic System for Hardware Implementation of Evolutionary Predictive Algorithm
(I. L. Bukatova, L. L. Golik, et al.; MIKROELEKTRONIKA No 4, Jul-Aug 84)..... 13

INDUSTRIAL ELECTRONICS AND CONTROL INSTRUMENTATION

Industrial Robots and Transmanipulators - Important Link in Setup of Flexible Automated Production Lines
(Yu.N. Zhukov, S.D. Smirnov; ELEKTROTEKHNIKA, No 4, Apr 84)..... 14

Modular Electromechanical Industrial Robots
(S.V. Gruzdev, O.B. Korytko, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 15

International Exhibition "Industrial Robots '82"
(V.G. Galenko, B.M. Bodrov, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 15

Robotization of Electric Welding Processes
(Yu.A. Klochkov, V.S. Korshunov; ELEKTROTEKHNIKA, No 4, Apr 84)..... 16

Microcomputer in Control System of Robotized Warehouse Complex
(A.P. Yelizarov, M.Ya. Rovenskiy, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 17

Robotization of Technological Processes in High-Frequency Heating and Welding
(F.V. Bezmenov, S.Ye. Ryskin, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 18

Improving Operational Reliability and Productivity of Robotized Technological Complexes
(V.G. Galenko, Yu.Ye. Onichkin, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 18

Automation of Ship Removal from Cutting Zone in Robotized Flexible Production Lines
(A.P. Yelizarov; ELEKTROTEKHNIKA, No 4, Apr 84)..... 19

Automation of Assembly of Electrical Products
(V.A. Lebedenko; ELEKTROTEKHNIKA, No 4, Apr 84)..... 19

Automation of Production of Semiconductor Power Devices
(R.V. Kyuts, G.K. Toomsoo; ELEKTROTEKHNIKA, No 4, Apr 84)..... 20

Automatic Testing of ABP-1500 Breakdown-Proof Power Supply Sets
(N.A. Aver'yanov, Ye.I. Berkovich, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 21

Galvanizing Process Lines Consisting of Clustered Assembly Units with Control by Microcomputer
(B.G. Bereslavskaya, I.V. Ovchinnikov, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 22

Progressive Technological Processes in Production of Electromagnetic Yokes
(R.A. Babushkin, S.I. Kopylov, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 23

Outlook for Improving Economy of Materials and Energy Through Improvement of Technology of Pressure-Die Casting of Rotors
(V.A. Rebenko, G.S. Abramov, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 23

Methods of Reducing and Utilizing Energy Losses in Induction Equipment
(A.B. Kuvaldin, I.P. Sal'nikova, et al; ELEKTROTEKHNIKA, No 4, Apr 84)..... 24

Infrared Electric Heating - One Way to Economize Energy Resources
(A.P. Slobodskoy, A.Ye. Kovalev, et al.; ELEKTROTEKHNIKA No 4, Apr 84)..... 25

Helical Wideband Filter for Interference Suppression in Converting Devices
(Yu.N. Pchel'nikov; ELEKTROTEKHNIKA, No 4, Apr 84)..... 26

Calculation and Optimization of Parameters of High-Power Capacitive Energy Storing Devices with Pulse Discharge into Resistive Load
(L.P. Kubarev; ELEKTROTEKHNIKA, No 4, Apr 84)..... 26

Effect of Copper Shield on Electromagnetic and Thermal Processes in Stator End Zone of 500 MW Turbogenerator
(N.L. Bityutskiy, A.Yu. Derzhavina, et al.; ELEKTROTEKHNIKA, No 4, Apr 84)..... 27

INSTRUMENTATION AND MEASUREMENTS

Metrological Support for Information-Measurement Systems for Analyzing Parameters of Random Signals
(Ye. D. Koltik, G. D. Muginova; METROLOGIYA, No 6, Jun 84)..... 28

Measurements of Polarization Characteristics of Radiation Field of On-Board Aircraft Antennas
(E. D. Gazazyan, V. G. Panchenko; METROLOGIYA, No 6, Jun 84)..... 28

Spectral Noise Density and Random Errors of Pulse Frequency Characteristic Meters
(A. V. Purtov, Ye. V. Krsheminskaya; METROLOGIYA, No 6, Jun 84)..... 29

Question of Numerical Methods of Solution of External Boundary-Value Problems of Electrical Field
(Valentin Timofeyevich Ivanov, Galina Nikolayevna Nekhayeva; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA, No 6, Jun 84)..... 29

MAGNETICS

Approximate Analytic Solution of Problem of Formation of Relativistic Electron Beam in Coaxial Diode in Presence of Various Insulating Magnetic Fields
(V. Ye. Nechayev; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 30

Nonlinear Electromagnetic Waves in Ferromagnetic Conducting Media
(F. G. Bass, N. N. Nasonov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 30

MICROWAVE THEORY AND TECHNIQUES

Numerical Investigation of Diffraction Models of Microwave Integrated Circuits
(V. V. Nikol'skiy, T. I. Nikol'skaya; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 32

Generation of Superpowerful Microsecond Electromagnetic Radiation Pulses
(S. P. Bugayev, V. I. Kanavets, et al.; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 32

Optimization of Parameters of Microwave Energy Converters
(L. L. Anan'yev, D. A. Borisov, et al.; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 33

Scattering of Electromagnetic Waves in Flat Waveguide with Bilateral Diaphragms
(V. D. Luk'yanov, G. L. Nikitin; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 33

Investigation of Type H:$LiTaO_3$ Optical Waveguides
(V. V. Atuchin, Zakhar'yash; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 34

Resists for Dry Microlithography
(G. K. Selivanov, T. A. Mshenskaya, et al.; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 34

Modeling of Processes Occurring in Resists During Electron-Beam Exposure
(V. P. Derkach, V. M. Korsunskiy, et al.; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 35

Investigation of Sensitivity of Metal Methylmethacrylate Copolymers with Methacrylic Acid to Shortwave Ultraviolent Radiation
(A. Ya. Vayner, A.N. Yakimenko, et al.; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 35

Comparative Analysis of Dynamic Characteristics of Base Elements of Digital Integrated Circuits Based on GaAs, InP and Si at 300 and 77K Temperatures
(N. N. Buyanov, Yu. I. Pashintsev; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 36

Some Characteristics of Storage Elements Based on Superconducting Quantum Interferometer
(L. A. Maslova, R. A. Chentsov; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 36

Determination of Anisotropy Constant of Epitaxial Ferrite-Garnet Films with Different Crystallographic Orientation by Phase Transition Method
(I. Ye. Dikshteyn, F. V. Lisovskiy, et al.; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 37

Functional Checking of Microprocessors and Microprocessor Systems
(P. A. Arutyunov, N. B. Gomanilova; MIKROELEKTRONIKA, No 4, Jul-Aug 84)..... 37

Circuit Engineering and Technological Optimization of Very High Speed LSI Logic Elements and Transistor Structures
(A. N. Bubennikov; MIKROELEKTRONIKA, No 4, Jul-Aug 84)... 38

POWER ENGINEERING

Timeliness of Directions for Use of Secondary Thermal Power Resources (Secondary Energy Resources)
(P. S. Kolobkov, O. V. Filip'yev, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 3, Mar 84). 39

Features of African Hydraulic Power Engineering
(M.V. Derzhko, P.V. Kaminskiy, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 3, Mar 84). 40

Effective Use of Secondary Power Resources
(A.A. Kozhevnikov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 3, Mar 84)..... 40

Optimization of Dimensions and Position in Cylindrical Enclosure of High-Voltage Metallic Screens
(Ye. S. Kolechitskiy, Yu. V. Yeliseyev; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 5, May 84)..... 41

Automatic Control Regime of Power System with Respect to Voltage Under Conditions of Emergency Deficiency of Reactive Power
(Ye. V. Kalentionok, V. A. Faybisovich; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 5, May 84)..... 42

Concerning Allowance in Technical-Economic Calculations for Growth Dynamics of Water Power and Complex Hydroeconomic Objects
(P.P. Dolgov, M.V. Semenov, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 5, May 84)..... 42

Problems in Creating Powerful Hydroelectric Motor-Generators for Water Storage Power Plants
(S.I. Gol'denberg, V.P. Loshkarev, et al.; ELEKTROTEKHNIKA, No 6, Jun 84)..... 43

Principal Characteristics of New Series of Transformers for High-Power Electric Thyristor Drives
(V.Z. Vinnik, I.A. Zborovskiy, et al.; ELEKTROTEKHNIKA, No 6, Jun 84)..... 44

Device for Investigation of Structural Elements of High-Power Transformers During Action of Dynamic Axial Forces
(A.I. Lur'ye, L.I. Mil'man, et al.; ELEKTROTEKHNIKA, No 6, Jun 84)..... 44

Installation for Tests of Apparatus in Magnetic Field up to 6,000 A/m
(Ye. A. Khagemeyster, A.M. Ginovker, et al.; ELEKTROTEKHNIKA, No 6, Jun 84)..... 45

Improvement of Methods for Calculation of Mechanical Vibrations of Low-Power Asynchronous Electric Motors at Their Design Stage
(Karen Artsvikovich Alikhanyan; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA, No 6, Jun 84).... 45

Problems of Development of Power Engineering in USSR
(N. N. Kovalev; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 7, Jul 84)..... 46

Integral Characteristics of Modes of Post-Accident Conditions of Complex Systems
(Yu. A. Fokin; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 7, Jul 84)..... 46

Impedance of Conductor-Ground Circuit in Cables Considering Sheathing
(L. I. Izmaylova, V. F. Kalyuzhnyy; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 7, Jul 84)..... 47

Structure of Energy Losses in Rail Traction Power Supply Systems
(L. A. German, V. A. Basov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 7, Jul 84)..... 47

Determination of Distance to Location of Damage Employing Digital Method of Measuring Currents and Voltages
(Yu. F. Korolyuk; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 7, Jul 84)..... 48

Achievements of USSR Power Systems in Reducing Specific Consumption of Organic Fuel
(A. S. Gorshkov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA, No 7, Jul 84)..... 48

QUANTUM ELECTRONICS/ELECTRO-OPTICS

Calculation of Energy Characteristics of Double-Passage Amplifier
(A. A. Betin, A. I. Dyatlov, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 49

Frequency Shifting in Multimode Fiber Optic Phase Modulation Devices
(V. Yu. Petrun'kin, O. I, Kotov, et al.; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 49

Efficiency of Photoelectric Conversion of Short Radiation Pulses
(V. D. Rumyantsev, N. M. Saradzhishvili; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 50

Pulsed Neodymium Glass Laser System for Investigating Nonlinear Optical Phenomena in Gases
(V. F. Lukinykh, S.A . Myslivets, et al.; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 50

Influence of Mode Noise Suppression in Multimode Fiber Optic Light Guides
(V. Yu. Petrun'kin, O. I. Kotov, et al.; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 51

Nonlinear Interferometry
(Kh. P. Alum, Yu. V. Koval'chuk, et al.; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 51

SOLID STATE CIRCUITS

Millimeter-Band Gunn-Effect Oscillators (A Review)
(N. Ye. Skvortsova; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 53

SONICS AND ULTRASONICS

Characteristics of Light Diffraction by Two Acoustic Waves, One with Complex Frequency Composition
(Yu. G. Vasil'yev; RADIOTEKHNIKA I ELEKTRONIKA, No 5, May 84)..... 54

NEW ACTIVITIES, MISCELLANEOUS

Third Plenary Session of Central Administration of Power Engineering and Electrical Industry Scientific-Technical Association Imeni Academician G. M. Krzhizhanovskiy
(A.K. Kazakov; ELEKTROTEKHNIKA, No 4, Apr 84)..... 55

Influence of Interference on Directivity Pattern During Boundary Detachment of Surface Electromagnetic Wave in Infrared Band
(G. N. Zhizhin, S. A. Kiselev, et al.; ZHURNAL TEKHNICHESKOY FIZIKI, No 5, May 84)..... 55

Applicability of Phase Integral Method in Problem of Linear Transformation of Waves with Allowance for Absorption (N. S. Bellyustin; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 56

Fifth Conference of Socialist Countries on Liquid Crystals (V. V. Kocharovskiy, Vl. V. Kocharovskiy; IZVESTIYA VYSSHIKH UCHEBENYKH ZAVEDENIY: RADIOFIZIKA, No 5, May 84)..... 56

ANTENNAS AND PROPAGATION

MEASUREMENT OF SNOW COVER THICKNESS BY RADAR SOUNDING

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 22 Aug 83) pp 998-1000

BOGORODSKIY, V. V. and POZNYAK, V. I., Arctic and Antarctic Scientific-Research Institute, Leningrad

[Abstract] A new radar method for investigating snow cover developed at the Arctic and Antarctic Scientific Research Institute is described and shown to be effective for measuring the ground snow cover thickness at mid-latitudes, which varies from several centimeters to a meter or more. A pulsed radar instrument emitting at a center frequency of 10 GHz and producing peak pulse power of 3 watts is described. The radio wave propagation velocity in snow is determined from measurements of the snow density and temperature along the radar sounding routes. The method and equipment can be used to measure snow thickness on various underlying surfaces and to measure the thickness of ice on fresh water. Figures 2; tables 1; references: 2 Russian.
[304-6900]

UDC: 537.874.6

DIFFRACTION OF PLANE ELECTROMAGNETIC WAVES ON SEMIINFINITE GRID OF PARALLEL CONDUCTORS ARRANGED AT AN ANGLE TO ITS EDGE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 15 Jul 82) pp 856-865

ROZOV, V. A. and TRET'YAKOV, S. A.

[Abstract] The problem is examined of diffraction on a semiinfinite grid comprised of parallel conductors set at an arbitrary angle to the grid edge with an oblique incident plane wave. The scattered field is found to represent the superposition of geometric optical, edge and surface waves. No surface wave occurs when the conductors are parallel to the edge of the grid, or when the angle between the x axis and the direction to the source is the same as the angle between ζ_0 and $\bar{=} x_0$. When the wave is normally incident with respect to the edge of the grid, no surface wave occurs when the

conductors are parallel or perpendicular to the edge. The solution obtained by the Kirchoff approximation method contains no surface wave, and the edge wave depends differently upon the parameters of the grid and the coordinates of the observation point than for the more rigorous solution. Figures 4; references 8: 6 Russian, 2 Western (1 Russian translation).
[295-6900]

UDC: 621.391.2:519.24

RULES FOR POST-DETECTOR DETECTION OF WEAK SIGNALS IN NON-GAUSSIAN NOISE OF UNKNOWN POWER

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 27 Jul 82) pp 914-919

NIKITIN, Ya. Yu. and FILIMONOV, R. P.

[Abstract] A general method is presented for constructing post-detector rules for detecting weak signals whose envelope is characterized by a non-gaussian distribution function. Locally most powerful ranking detection rules, as well as parametric noise-invariant detection rules, are derived. The explicit form of the corresponding characteristics is obtained for examples of noise for which the envelope is described by a Nakagami or Weibull distribution. Comparison of the structure of the ranking and invariant statistics indicates that the ranking statistics are simpler. The results are based on a formula derived for the local representation for the density of the envelope of the signal-noise mixture. References 13: 10 Russian, 3 Western (2 in Russian translation).
[295-6900]

UDC: 621.396.96.08:621.391.26

MINIMIZATION OF ANOMALOUS ERRORS IN MEASURING SYSTEMS EMPLOYING SEARCH AND TESTING DEVICES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 18 Oct 82) pp 920-927

KATIKOV, V. M.

[Abstract] The optimization problem of making a rational choice of the technical parameters of signal detectors employed in search and testing devices based on minimizing the mean losses caused by anomalous errors which disrupt the measurement process is examined for the case of a tracking device which performs signal searching and tests measurement accuracy. General optimality conditions are derived, and incoherent signal detection is discussed. The analytical method presented eliminates the arbitrariness involved in defining the requirements for the characteristics of detectors

in measuring systems based on intuitive conceptions, and defines the requirements on the basis of the observer's attitude to anomalous phenomena in the measurement process. A theorem is derived and proved which simplifies the computational procedure involved in the numerical solution of parametric optimization problems for specific measuring systems incorporating digital signal processors in which the internal parameters can be autonomously optimized. Figures 1; references: 3 Russian.
[295-6900]

UDC: 621.396.677.49

POSSIBILITY OF REALIZATION OF HIGHLY-DIRECTIONAL ANTENNA ARRAYS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 13 Apr 82) pp 990-991

PAVLYUK, V. A., SIGOVA, T. A., MARTYNOV, M. A. and KISMERESHKIN, V. P.

[Abstract] The results are reported of experiments conducted in a chamber with with a coefficient of reflection of -20 db at 1 GHz on axial linear equidistant arrays of 2, 3 and 4 elements with maximum directional gain. Allowance is made for a priori information by determining the mutual influence of the radiators and errors in the tuning of the array. A mathematical model is developed which can be used to determine the potential capabilities of highly directional systems. It is shown analytically that maximum directional gain for a linear equidistant array of isotropic elements spaced $d=0.5\ \lambda$ apart can be achieved in a highly-directional array with dimensions reduced by factors of approximately 10-50 while varying the value of γ from 10^{-1} to 10^{-4}. The analytical and experimental data provide evidence that miniature antenna systems with enhanced frequency selectivity and directivity can be developed. Figures 1; tables 1; references: 4 Russian.
[295-6900]

UDC: 523.164:53.08:621.396.67

MEASUREMENT OF MAIN PARAMETERS OF RT-70 ANTENNA

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 17 Jun 83) pp 543-549

ASLANYAN, A. M., GULYAN, A. G., KOZLOV, A. N., TARASOV, V. B., MARTIROSYAN, R. M., GRISHMANOVSKIY, V. A. and SERGEYEV, B. G.

[Abstract] Radio astronomical investigation of the parameters of the RT-70 dual-reflector quasi-parabolic Gregory antenna is described. It is found that the phase distortions caused by gravity deformations of the reflector system as the antenna is tilted have practically no influence on the effective area of the antenna in the decimeter band. Such gravity deformations in the

centimeter band cause phase distortions in the aperture which reduce the effective area significantly. The effective area becomes a stronger function of the elevation angle as the wavelength becomes shorter. A counter-reflector movement principle is found which compensates for phase distortions in the aperture in the long-wave portion of the centimeter band. Tables 5; references 11: 4 Russian, 7 Western.
[294-6900]

UDC: 537.874.4

TWO-DIMENSIONAL OPEN RESONATORS WITH CYLINDRICAL MIRRORS

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 (manuscript received 23 May 83) pp 604-612

KOSHPARENOK, V. N., MELEZHIK, P. N., POYEDINCHUK, A. Ye. and SHESTOPALOV, V. P., Institute of Radio Physics and Electronics

[Abstract] The mathematically rigorous Riemann-Hilbert method is used to construct a solution of the Maxwell equations for two-dimensional open resonators formed by a finite number of open screens coinciding with portions of the surfaces of round cylinders. The resonance wavelength is assumed to be comparable with the characteristic dimension of the structure. A solution makes it possible to analyze the physical processes occurring in open resonators, in a system of diffraction coupled open resonators and two-layer open resonant structures. Figures 6; tables 1; references: 15 Russian.
[294-6900]

UDC: 621.371.399

DIFFRACTION OF ELECTROMAGNETIC WAVES ON GRID OF CYLINDRICAL SEMICONDUCTING RODS IN FLAT DIELECTRIC LAYER

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 (manuscript received 23 May 83) pp 613-627

KAPLUN, V. A. and KULISH, V. G., All-Union Polytechnical Correspondence Institute

[Abstract] The problem of diffraction of electromagnetic waves on a grid of parallel semiconducting rods contained in a flat dielectric layer is solved. A system of simple linear equations is derived for the propagation constant of the electromagnetic wave along the grid. The relationship between the propagation constant and the parameters of the grid of rods and dielectric layer is found. Conditions for the excitation by an external electromagnetic wave are examined. Expressions are derived for the fields within and without the layer. Formulas for the coefficients of transmission and reflection are obtained for cases of practical interest. The theoretical findings are

verified experimentally, indicating good agreement. Figures 6; references 4: 3 Russian, 1 Western in Russian translation.
[294-6900]

UDC: 621.371.631.1:523.532:550.38

SCATTERING OF RADIO WAVES ON MAGNETIZED METEOR TRAIL

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 (manuscript received 6 Jun 83) pp 661-664

SIDOROV, V. V., and KHUZYASHEV, R. G., Kazan State University

[Abstract] A nonmutual meteor radio channel is modeled by scattering of normally incident radio waves on an infinite axially magnetized plasma cylinder. The diffraction problem is solved over a wide interval of magnetic field values. Analysis of the behavior of three values of the linear electron density reveals that the difference between the direct and return wave depends upon the volumetric electron density. When the volumetric electron density is high, i.e., when the radii of the trail are small and the electromagnetic field penetrates little into the plasma cylinder, the latter is approximated by a metal cylinder and there is little difference between the outgoing and return signal. As the meteor trail expands and the amplitude of the reflecting signal increases, the volumetric electron density becomes smaller, the field penetrates deeper into the plasma and the influence of anisotropy of the meteor trail on the characteristics of the outgoing and return wave becomes stronger. According to the model, the best method to reduce nonmutuality is to use high working frequencies in order to reduce the gyro frequency of the magnetic resonance. Figures 2; references 5: 3 Russian, 2 Western (1 in Russian translation).
[294-6900]

UDC: 621.371.333.535.42

ELECTROMAGNETIC ENERGY FLUX LINES NEAR HALF-PLANE

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 (manuscript received 9 Nov 83) pp 675-676

NEFEDOV, V. P.

[Abstract] The energy flux lines of a plane electromagnetic wave normally incident on an ideally conducting half-plane are computed. The energy flux vector is computed on the basis of rigorous representations of the electrical and magnetic intensity vectors based on Oberhettinger's solution for the diffraction of a plane wave on a wedge. The results augment Braunbek and Laukein's findings by considering both cases of polarization of electromagnetic waves in a larger vicinity of the edge of the half-plane. Figures 2; references 5: 1 Russian, 4 Western (1 in Russian translation).
[294-6900]

CIRCUITS AND SYSTEMS

UDC: 621.372.4.029.65

SELECTION OF LONGITUDINAL LOWER-TYPES OF OSCILLATIONS OF OPEN MILLIMETER-BAND RESONATOR BY ELONGATED RESONANT HETEROGENEITIES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 5 Jul 82) pp 894-900

MULGAKOV, B. M., SKRESANOV, V. N., FISUN, A. I. and SHUBNYY, A. I.

[Abstract] The paper examines a simple method for selecting longitudinal lower types of oscillations based on the resonant properties of elongated rectangular heterogeneities located either on the surface of one of the reflectors or within the open cavity. The method is based on the resonant frequency-discriminating properties of the heterogeneities. The method is superior to the familiar selection approach employing an echelette mirror in that it provides the ability to tune the resonator-filter easily throughout the frequency band by varying the height of the heterogeneity and the distance between the mirrors simultaneously. This makes it possible to employ heterogeneous reflectors in the oscillating systems of devices employing quasi-optical resonators in order to expand the mechanical tuning band. Figures 4; references: 10 Russian.
[295-6900]

UDC: 621.396:621.391.82:538.56

DISRUPTION OF QUASI-PERIODIC MOVEMENT CAUSED BY DOUBLING AND STOCHASTICITY IN A SYSTEM OF OSCILLATORS

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 6 Jun 83) pp 565-575

ANISHCHENKO, V. S., LETCHFORD, T. Ye. and SAFONOVA, M. A., Saratov State University

[Abstract] Electrical oscillations in a system of two coupled oscillators with inertial nonlinearity are studied in order to investigate the occurrence of stochasticity during disruption of quasi-periodic movement as the result of "two-dimensional torus - strange attractor" bifurcations. The

mechanism underlying the occurrence of a strange attractor caused by the accumulation of doubling bifurcations of one of the characteristic oscillation periods on a two-dimensional torus is numerically analyzed. It is found that stochastic self-sustained oscillations patterned after a strange attractor in the phase space of a system occur caused by the disruption of quasi-periodic movement resulting from the realization of one possible bifurcation situation. A phase transition characterized by a jump of Lyapunov dimensionality on the torus when the critical point is reached corresponds to the mechanism investigated. The authors thank G. A. Umnov and V. A. Rodionov for making a computer available to them. They also thank Yu. L. Klimontovich and A. I. Khibink for preliminary acquaintance with the work and a number of helpful comments which were taken into consideration by the authors in the final editing. Figures 7; references 22: 16 Russian, 6 Western.
[294-6900]

UDC: 517.9

SYNCHRONIZATION AND RANDOMIZATION OF ENSEMBLE OF FEEDBACK OSCILLATORS BY EXTERNAL NOISE

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 13 Apr 83) pp 576-581

PIKOVSKIY, A. S., Institute of Applied Physics, USSR Academy of Sciences

[Abstract] Effects of synchronization and desynchronization of the response of an ensemble of feedback oscillators caused by a random external field are examined. The ensemble response is described as a random function of time. The degree of correlation between the amplitudes and phases of the individual oscillators are determined. It is found that external noise results in effects analogous to the frequency capture and stochasticity phenomena observed when a periodic external force acts upon a system exhibiting self-sustained oscillations. The mechanism described also holds for the case in which the external noise acts upon an ensemble of nonlinear oscillations with attenuation. The authors thank M.I. Rabinovich for helpful comments. Figures 3; references 4: 3 Russian, 1 Western.
[294-6900]

UDC: 621.372

COMPENSATION OF PHASE DISTORTION OF WAVE FIELDS WITH HELP OF IRREGULAR PERIODIC DIFFRACTION STRUCTURES

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 (manuscript received 9 Jun 83) pp 595-603

KURAYEV, A. A., LUK, L. N., PLOTKINA, S. M., SLEPYAN, A. Ya. and SLEPYAN, G. Ya., Minsk Radiometric Engineering Institute

[Abstract] A principle for compensating the phase distortions is proposed on the basis of diffraction irregular periodic structures with characteristic dimensions comparable to the wavelength. An engineering method is formulated for designing phase correcting structures based on solving the problem of the diffraction of a plane wave on a double periodic infinite lattice of rectangular (square) metal plates. A numerical method for solving the diffraction problem is developed; the results of machine calculations are presented. Experiments are cited which indicate the effectiveness of the proposed principle. Figures 5; references 12: 11 Russian, 1 Western in Russian translation.
[294-6900]

UDC 681.584.7.004.58.075.8

USE OF FUNCTIONAL DIAGNOSIS DEVICES IN STRUGGLE WITH AFTEREFFECTS OF FAILURES OF MICROPROCESSOR RELAY PROTECTION SYSTEMS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 5, May 84 (manuscript received 31 Dec 82) pp 3-6

GEMST, V. K., candidate of technical sciences, docent and ROGANOV, V. R., engineer, Riga Order of Labor Red Banner Polytechnic Institute

[Abstract] An investigation and tests made of the use of microelectronic computers and microprocessor relay protection systems (MPRP) show that such systems make it possible more qualitatively to solve problems of power object protection, in comparison with the widely used relay protection devices created on a basis of analog techniques. However, in spite of their merits, MPRP have a number of shortcomings. Among them are a tendency towards some forms of serviceability breakdowns. The reasons for these breakdowns and methods of struggle with them are considered. It is concluded that requirements for a guarantee of the reliability of microprocessor relay protection systems can only be fulfilled with the existence of a complex-microprocessor relay protection system equipped with a functional diagnosis device. The paper was presented by the Software Department Faculty of the Riga Polytechnic Institute. Figures 2; references 5: 1 Russian; 4 Western. [287-6415]

UDC 621.316.925.019.3

ASSURANCE OF RELIABILITY OF RELAY PROTECTION MICROPROCESSOR DEVICES

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 3, Mar 84 (manuscript received 31 Jan 83) pp 26-30

FOMCHENKOV, A.P., engineer, Moscow Order of Lenin and Order of the October Revolution Power Engineering Institute

[Abstract] In connection with five alternate versions under consideration for fulfillment of relay protection by microprocessor computing systems, the possibility is evaluated of assuring a given level of relay protection

reliability, and a conclusion is made concerning appropriate forms of redundancy. Calculation of the reliability of the alternate versions is conducted by a method postulated in 1982 at the "Energoset'proyekt" (Power network project). It is concluded that it is only possible to assure the required level of reliability of microprocessor relay protection by a combined use of redundancy circuits and automatic inspection of a malfunction of the protective devices. In the process, a redundancy circuit is unacceptable with respect to OR, and together with the majority redundancy, the advisability occurs of also using redundancy circuits with respect to AND. Simple analytical expressions for calculation of the period between tests of the microprocessor relay protection are obtained for the redundancy circuits under analysis. It is shown that for values of the parameter flow of failure by one microelectronic computer $\omega \geqslant 10^{-4}$ 1/h, the period between tests is determined by the condition of assuring the required value of the parameter of the flow of false responses. The paper was submitted by the Relay Protection and Automation of Power Systems Department Faculty of the Moscow Power Engineering Institute. Tables 1; references: 3 Russian. [288-6415]

UDC 538.54

SIMPLIFIED EQUATION FOR CALCULATION OF ELECTROMAGNETIC FIELDS IN THIN CYLINDRICAL LAYERS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 3, Mar 84 (manuscript received 9 Sep 82) pp 38-41

GRACH, I.M., candidate of technical sciences, docent; and FAYDE, M.N., Frunze Polytechnic Institute

[Abstract] A simplified equation is derived, which is for use during an analysis of electromagnetic systems with screens of cylindrical form, induction heating of cylindrical conductors, etc., where the necessity arises for calculation of harmonic fields in thin cylindrical layers. References: 2 Western in Russian translation.
[288-6415]

UDC: 534.-16.012.013:539.2

FUNDAMENTAL ENERGY LOSSES IN QUARTZ CRYSTALS IN $4 \cdot 10^4$-$1.8 \cdot 10^9$ Hz FREQUENCY RANGE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 30 Dec 82) pp 992-994

SMAGIN, A. G.

[Abstract] A method is proposed for obtaining a surface layer with acoustic properties close to those of a single crystal, which makes it possible to avoid Zener losses. The excitation of quartz specimens at their fundamental frequencies and harmonics confirms that the relationship Q_ω=const holds in the $4 \cdot 10^4$-$1.8 \cdot 10^9$ Hz frequency range, which is determined by the physical properties of the crystals. The proposed approach makes it possible to investigate fundamental losses and relaxation phenomena in crystals over a wide range of frequencies and temperatures. Figures 2; references 8: 7 Russian, 1 Western.
[295-6900]

UDC: 621.382.2

NEW CLASS OF SEMICONDUCTOR DIODES

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 27 Apr 83 after revision) pp 953-954

AMIRKHANOV, Kh. I., BASHIROV, R. I., ALIYEV, K. M. and GADZHIALIYEV, M. M., Institute of Physics, Dagestan Affiliated Branch, USSR Academy of Sciences, Makhachkala

[Abstract] Results obtained during the development of a new class of alternating current rectifiers not incorporating electron-hole transition are presented. The new rectifiers operate on the basis of b-drift created by self-heating of the semiconductor because of power losses of the rectified current and directional heat release. Specimens of hole and electron germanium in the form of rectangular plates are investigated, indicating that the field term of the b-drift increases the reverse voltage in pure specimens

of germanium. The influence of the field term in the forward direction is insignificant. Figures 2; references 3: Russian.
[304-6900]

UDC: 621.382

OPTOELECTRONIC SYSTEM FOR HARDWARE IMPLEMENTATION OF EVOLUTIONARY PREDICTIVE ALGORITHM

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 27 Oct 83) pp 348-355

BUKATOVA, I. L., GOLIK, L. L., YELINSON, M. I., PEROV, P. I. and SHAROV, A. M., Institute of Radio Engineering and Electronics, USSR Academy of Sciences

[Abstract] A system is described for predicting a sequence of binary symbols which employs an evolutionary predictive algorithm, that is classified as an algorithm for structural synthesis of determinate automata in which the structure of the automata varies within a given class of structure. A structural diagram of the hardware implementation of the evolutionary predictive algorithm is presented, in which the main section is a network of 48 functional and 48 control elements. The speed of the device is determined by the write and clear time of the memory matrices. It is estimated that the system learns within an average of 1000 transmission cycles of its history (i.e., after each functional element has generated 20,000 output responses). Figures 2; references 8: 6 Russian, 2 Western (both in Russian translation).
[303-6900]

UDC 621.3:65.011.56:007.52

INDUSTRIAL ROBOTS AND TRANSMANIPULATORS - IMPORTANT LINK IN SETUP OF FLEXIBLE AUTOMATED PRODUCTION LINES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 22 Sep 83) pp 2-4

ZHUKOV, Yu.N., director, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology), and SMIRNOV, S.D., candidate of technical sciences, chief industrial engineer

[Abstract] Industrial robots play an important part in conversion of automated high-volume production lines from "stiff" ones designed for a few (2-8) product items to "flexible" or fast-readjustable ones designed for more (50-300) product items, production lines already employing digital program control of machine tools through micro-, mini-, or macrocomputer depending on the hierarchical level required. In the production of electrical machines, specifically, it is necessary to automate completely and robotize not only machining operations but also forging and casting operations as well as galvanizing and painting processes, reprocessing of thermoplastic and thermosetting materials. Approximately 30 models of industrial robots will be introduced for this by 1986, second-generation adaptive robots with artificial intelligence to be ready by 1990. Among the robots, developed by the All-Union Design Engineering Institute of Electrotechnology jointly with the Central Scientific Research Institute of Robotized Technological Complexes are the PREM series ones with load lifting capacities of 0.5, 5, 25, 63 kg. Production of electric motors will have a high priority, because electromechanical drives are used for manufacturing of more than 80% of all industrial products. The All-Union Scientific Research and Design Engineering Technological Institute of Electric Welding Equipment, the All-Union Scientific Research Institute of Electrothermal Equipment, the All-Union Scientific Research Institute of High-Frequency Currents, and the All-Union Scientific Research Institute of Electrical Apparatus Design will also participate in the development. Figures 1; references: 7 Russian. [243-2415]

UDC 621.3.002.2.007.52

MODULAR ELECTROMECHANICAL INDUSTRIAL ROBOTS

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 pp 4-7

GRUZDEV, S.V., KORYTKO, O.B. and YUREVICH, Ye.I., TSNII RTK (Central Scientific Research Institute of Robotized Technological Complexes)

[Abstract] The modular principle of electromechanical industrial robots is to provide maximum design versatility with a limited number of standard components and the optimum design variant for a particular technological process. A total line of modular electromechanical industrial robots is being developed in the USSR, to cover the 0.2-160 kg range of load lifting capacity with three basic models: PREM-0.5, PREM-5, PREM-100. The major five components of each robot are the manipulator, drive, drive control, gripping device, gripping device control mechanically or electrically coupled as appropriate. Standardization pertains to translational and rotational kinemetic couples, contact surfaces between mechanical modules, and electric drive sets, especially with respect to mounting and coupling dimensions. The mechanical part of an industrial robot can be standardized through structural uniformity, or through minimum dependence of the robot design on the form of energy used and on the method of control, or on nameplate-delivery-interchangeability basis with maximum degree of functional and structural completeness, or for selectivity of internal manufacturing and engineering implementation of the design, or through minimization of the number of module sizes. All these five principles have been incorporated in the generalized PREM concept. The principal modules in all robots of this line are third-level functional ones, their principal performance parameter being the installed motor power and their other essential performance parameters being force or torque, travel, nominal velocity, and absolute positioning error of the output link. Figures 5; tables 3.
[243-2415]

UDC 061.4:658.52.011.56

INTERNATIONAL EXHIBITION "INDUSTRIAL ROBOTS '82"

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 22 Sep 83) pp 9-12

GALENKO, V.G., engineer, BODROV, B.M., engineer, and SHISHKIN, V.V., engineer, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] At the international exhibition "Industrial Robots '82" in Leningrad (October 1982) the latest achievements were displayed in flexible automated production lines with digital program control through microprocessors and mini-computers. Sixty manufacturers from Australia, Bulgaria,

Czechoslovakia, GDR, Italy, Japan, Netherlands and Sweden participated in the exhibition. The industrial robots exhibited here were auxiliary ones for parts handling (transport, loading, unloading), technological ones for parts processing (electric welding, coating), and technological ones for final operations (assembly). The exhibits demonstrated the prevalent trend toward modular construction, greater complexity for greater versatility, positional and outline-tracing control with linear and circular interpolators, more precise positioning within $\pm$ 0.02 mm, and more degrees of freedom up to six, also toward a common relative system of measurements for controls. Most outstanding were the modular industrial robots exhibited by Bosch GmbH (FRG), the universal industrial robots "Puma" and "Kawacaki Unimate" (Finland-US), the automatic manipulators "Pirin" (Bulgaria) and 2-4 hands operating sequentially or simultaneously and the industrial robots "Beroye" (Bulgaria) with hydraulic drive operating in cylindrical coordinates, and the industrial robot "Fanuc model 0" with "CNC Fanuc 6T" computer (Japan) incorporated in the ATM001 automatic production module (Bulgaria). In terms of application, highest ranking were the industrial robots for electric-arc welding (with CO_2 shield) with microprocessor or minicomputer program control exhibited by Shin Meiwa, Kemppi, Torstekmik, Nokia (Finland), and Atlas Copco, Devilbiss (UK).
[243-2415]

UDC 621.791.03.007.52

ROBOTIZATION OF ELECTRIC WELDING PROCESSES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 22 Sep 83) pp 13-14

KLOCHKOV, Yu.A., engineer, and KORSHUNOV, V.S., engineer, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] The purpose for using industrial robots for electric spot welding is to combine the advantages of high-volume automation and flexible manual production while reducing the disadvantages of both, namely "stiffness" and high labor cost, respectively. According to ASEA's (Sweden) production data covering the West European welding industry, replacement of manual welding with a robot is economically justified for an annual production of 1000-60,000 units. The welding robot developed in the USSR jointly by the All-Union Design Engineering Institute of Electrotechnology and the All-Union Scientific Research Technological Institute of Electric Welding Equipment consists of a PREM-25 manipulator for the torch, a torch with rod feeding mechanism, an arc supply source, a manipulator for the parts, extensive programming with automatic selection and, if necessary, adaptive control. The torch manipulator has a rotation module, a double-oscillation module, and a 2-stage wrist module. This modular structure and use of series 4A induction motors in the electrical servomechanism are outstanding features of this industrial welding robot. It has a load lifting capacity of 25 kg and has 5 degrees of freedom, along 5 simultaneously controllable

antropomorphic coordinates, operates with positional-outline mode of control with ±0.4 mm positioning error, and does not use the parts manipulator when operating with a conveyor belt. It has a pneumatic drive. Figures 2, tables 1.
[243-2415]

UDC [681.3:658.78].001.4

MICROCOMPUTER IN CONTROL SYSTEM OF ROBOTIZED WAREHOUSE COMPLEX

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 9 Aug 83) pp 14-17

YELIZAROV, A.P., engineer, ROVENSKIY, M.Ya., engineer, and FRIDMAN, B.E., candidate of technical sciences, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] Reliable multilevel control of robotized warehouse complexes and automated transport-warehouse complexes has been made feasible with the introduction of a microcomputer. Such a control system principally covers the stock-dispensing zone and the stock-dispensing cycle, which includes mechanization and automation of activities as well as addressing and accounting. The generalized model of information flow applies to all possible rack and shelf layouts, and can be modified for any degree of mechanization and automation. Existing first-generation STAS-50LT automated warehouses are controlled with stiff instruction-and-assignment logic, a minicomputer controlling both the stocking-dispensing zone and the crane-stacker in large warehouses. Changeover to more effective and versatile control by microcomputer is simplest with the algorithms retained but now executed programmatically on the basis of continuous reading of input data from transducers and human sensors, upon their conversion from analog-to-digital form. A more effective changeover involves the use of special application and microcomputer-oriented algorithms. Such a control system has been developed by the All-Union Design Engineering Institute of Electrotechnology on the basis of an "Elektronika S5-12" microcomputer, and is functionally equivalent to systems based on "Intel-8008" (US) or "Kone" (Finland) microcomputers. Its deficiency is that it still does not cover addressing and accounting. Another disadvantage, common to all existing control systems in warehouse complexes, is the use of a flexible multiconductor cable for signal transmission. Such a cable interferes with movements and lowers the reliability of controls. Figures 1; tables 3; references: 5 Russian.
[243-2415]

UDC 621.78.3.029.5.002.5.007.52

ROBOTIZATION OF TECHNOLOGICAL PROCESSES IN HIGH-FREQUENCY HEATING AND WELDING

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 22 Sep 83) pp 18-19

BEZMENOV, F.V., candidate of technical sciences, RYSKIN, S.Ye., engineer, SHEVCHENKO, V.G., engineer, and SHUKKEL', Yu.F., engineer, VNIITVCh imeni V.P. Vologdin (All-Union Scientific Research Institute of High-Frequency Currents imeni V.P. Vologdin)

[Abstract] Industrial robots are considered for performance of auxiliary operations in high-frequency heating and welding, the principal electrothermal process having already been highly automated with adequate control of all parameters. Auxiliary operations now performed manually, tedious handling of hot and often heavy parts, are difficult to automate so as to match the speed and productivity of the principal equipment. No industrial robots for this application are yet available, but conceptualization and development of special-purpose robotized technological complexes on the basis of the PREM-25 modular electro-mechanical industrial robot are under way. Appropriate modifications, especially of the manipulator gripping device, for such operations as feeding forged ingots into an induction furnace, preheating steel flange rings before calibration, preheating powder-metal pellets before stamping, or welding storage bins appear to be both worthwhile and promising. Figures 4.
[243-2415]

UDC [621.777.4:007.52].002.2

IMPROVING OPERATIONAL RELIABILITY AND PRODUCTIVITY OF ROBOTIZED TECHNOLOGICAL COMPLEXES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 22 Sep 83) pp 19-22

GALENKO, V.G., ONICHKIN, Yu.Ye., and BELYAVSKIY, L.M., engineers, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] Existing automation of industrial processes such as strip or sheet stamping is being converted to a higher level, i.e., to flexible automated production lines including a robotized technological complex, for the purpose of improving both productivity and reliability. The model PRP-5 industrial robot is eminently suitable for this particular process. Special manipulator gripping devices have been developed for unrolling and feeding strip or sheet off the reel. The gripping device for handling ferromagnetic materials essentially consists of a carriage on rollers with slidable fingers which carry magnets. The gripping device for handling non-magnetic materials

essentially consists of a cantilever beam carrying a spring-loaded cross arm and a set of spring-loaded vacuum suction cups which press on diaphragms. Most important for failure-free operation is proper separation of the strip or sheet from the reel. Stability of monitoring and control sensors is enhanced by installation of shock and vibration absorbers, viscous dampers having been found to be most effective and their design still being refined with emphasis on seals. Introduction of these features developed by the All-Union Design Engineering Institute of Electrotechnology should increase productivity by 20% and reduce losses on restoration of broken down equipment as well as the cost of standby capacity. Figures 5.
[243-2415]

UDC 621.91.658.52.011.56

AUTOMATION OF SHIP REMOVAL FROM CUTTING ZONE IN ROBOTIZED FLEXIBLE PRODUCTION LINES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 22 Sep 83) pp 22-24

YELIZAROV, A.P., engineer, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] A new pneumatic gang-type system with complete software has been developed by the All-Union Design Engineering Institute of Electrotechnology for program-controlled automatic chip removal from the cutting zone in robotized flexible production lines operating without lubricant-coolant fluid. The major improvement over such existing systems is that it includes provisions for separate removal of chips of different materials without mixing. High reliability and efficiency are ensured by elimination of curvilinear chip trajectories and installation of a dust trap with necessary tubing along the path of the air blast with original as well as comminuted chips. An automatic control system coordinates operation of the pneumatic system with the conveyor belt, while chips are tracked as they appear in each machine tool and are guided into appropriate bins. Figures 3; references: 3 Russian.
[243-2415]

UDC 621.316.002.72:65.011.56

AUTOMATION OF ASSEMBLY OF ELECTRICAL PRODUCTS

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 8 Aug 83) pp 25-27

LEBEDENKO, V.A., candidate of economical sciences, VNIIelektroapparat (All-Union Scientific Research Institute of Electrical Machine Manufacture)

[Abstract] Improving the assembly of low-voltage electrical products is an urgent problem, inasmuch as 30-70% of all the labor in a production line can

be expended on assembly operations. The conventional solution to this problem are readjustable continuous-flow conveyor belts with small-scale mechanization, the particular scheme depending on the production scale and the product characteristics. Another approach is to operate with free rather than rigid tempo and cycles at each station, to install a special interoperational transport with trays rather than a continuously moving conveyor belt, and to use standard technological equipment in lieu of small-scale mechanization. A production line has been designed and built on the basis of these unconventional principles for assembly of "Konstruktor" cut-out switches. The advantages as well as the disadvantages of such a system were considered in subsequent development of an automated flexible production line with robotized technological complex on this basis. Usually a single flexible assembly line is adequate for the hookup operations. Its most important link, the automatic manipulator for joining the product components together, consists of functional modules tentatively classifiable into six groups: 1) movers of base parts; 2) feeders and orientators of parts; 3) joiners of parts; 4) carriers and holders of parts; 5) inspection and control systems; 6) fasteners of parts. The advantages of using standard assembler modules are shorter lead time for production planning and layout, easier organization of specialty production lines, more versatility, and possibility of periodically refurbishing and updating a production line. The feasibility of this concept is demonstrated by a production line putting out 1.8 million VP-16 track switches annually. Figures 3.
[243-2415]

UDC 621.382.233.026.002.2:65.011.56

AUTOMATION OF PRODUCTION OF SEMICONDUCTOR POWER DEVICES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 4 Jul 83) pp 28-33

KYUTS, R.V., and TOOMSOO, G.K., candidates of technical sciences, NII MO "TEZ" imeni M.I. Kalinin, Tallin Electrical Engineering Plant imeni M.I. Kalinin)

[Abstract] Automation of the production of semiconductor power devices is proceeding in three main directions. First, an informational-consultative automatic system for control of technological processes is being developed. Then automatic control systems for groups of technological processes are being developed, essentially with a computer base. The informational-consultative system was installed in the Tallin plant during the 1980-83 period with a resulting 546,000 rubles annual production cost saving. It is now being installed in the "Elektrovypryamitel'" (Electrical Rectifier) plant, with functional and hardware modifications for operation in real time. Its accounting functions include tracking of parts, statistical analysis of product lots, inspection and correction for excessive reject rate. Its control functions include adaptive simulation of technological processes, with stabilization and correction, and predicting the electrical performance

characteristics of the final product. The software consists of general and special programs written in the MNEMOK OD programming language, for execution with the aid of data files and a real-time disk operating system. The hardware consists of an M-6000 modular computer with expanded memory on three magnetic disks (IZOT-1370) and four magnetic tapes (YeS-5017 Unified System), workshop terminals with teletypes, and testers. Operation of the automatic testing and data processing system used for production of thyristors in the Tallin plant illustrates both the principle and the effectiveness of such a setup. The data processing part consists of a "Viru" minicomputer with peripheral equipment. The testing part includes means of transporting as well as heating and cooling the test samples, and inserting them into the test circuit adequate electrical contact. The system has been designed for maximum productivity. A universal interface serves as unifying link between test modules. The software is based on interaction of four processes: POTOK (flow) - DIALOG - TSIKL (cycle) - OPERATSIYA (operation). The third direction of development is devising separate automated units of technological equipment. This development is now under way, with an "Elektronika-60M" microcomputer rather than the nonstandard "Viru" minicomputer as base. Figures 4; references: 2 Russian. [243-2415]

UDC 621.311.6:621.3.087.4.001.4

AUTOMATIC TESTING OF ABP-1500 BREAKDOWN-PROOF POWER SUPPLY SETS

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 18 Aug 83) pp 33-35

AVER'YANOV, N.A., engineer, BERKOVICH, Ye.I., candidate of technical sciences, MOTYL', A.P., candidate of technical sciences, PUKSPUU, T.R., candidate of technical sciences, and RIYSMAN, R.R., engineer, Tallin Electrical Engineering Plant imeni M.I. Kalinin

[Abstract] The expected high reliability of ABP-1500 breakdown-proof a.c./d.c. power supplies requires testing of all their output parameters for stability and deviations, while both rectifier and inverter stages are running around the clock with an open circuit and then afterwards a short circuit. Such a comprehensive testing can be done only automatically on a microcomputer base. An automatic testing system has been developed to these specifications with an "Elektronika-60M" (15 VM-16-012) microcomputer as base. The testing and data processing equipment includes a power-line timer, a monitor, analog-to-digital converters, a commutator switch, and a matching device. Analog signals are read within timer periods of 20 ms and measured within periods of 40 μs. The special test program, with chopping of timer signals, covers measurement of line voltage at the rectifier input, rectifier output voltage across the storage battery, inverter output voltage for motor load, inverter output voltage for static load, output voltage of thyristor cut-out switch, output voltage of thyristor transfer switch, control pulses for inverter bridge and control pulses for inverter-compensator. There are

13 analog inputs for analog signals within the ±30 V range, measured with an error not exceeding 0.1%. There are 3 discrete signals of +12 V amplitude. The microcomputer feeds data onto a punch tape and to a "Consul 260" printer with keyboard. Figures 3; tables 1.
[243-2415]

UDC 621.357:681.3-52.001.3

GALVANIZING PROCESS LINES CONSISTING OF CLUSTERED ASSEMBLY UNITS WITH CONTROL BY MICROCOMPUTER

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 28 Jul 83) pp 35-37

BERESLAVSKAYA, B.G., engineer, OVCHINNIKOV, I.V., engineer, YEL'YASHEVICH, I.V., engineer, and KAPLAN, B.M., engineer, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] Two galvanizing process lines have been developed by the All-Union Design Engineering Institute of Electrotechnology on the principle of modular construction and functional clustering, for electrolytic tanks with 1100x900x1000 mm and 1500x900x1000 mm capacity, respectively. In addition to cantilever automatic manipulators with 1500 N load lifting capacity, the main components of a functional cluster are the tank on adjustable-height mounts, a vertical metal rack with a horizontal I-beam guide rail, two lateral exhaust ducts with blowers, and an air collector. These components supplement a rotating drum with drive, steam or electric heaters, anode rods, oscillating cathode rods with rockers, and electrolyte feed pipes. They can be assembled for zinc coating or parkerizing as well as for etching ferrous or nonferrous metals. A sheath of acrylic glass around each automatic manipulator reflects splashing electrolyte back into the tank, thus contributing to an almost 50% recovery of waste. The control system based on an "Elektronika S5-12" microcomputer optimizes the process in terms of product quality and labor economy. Its capabilities include driving the manipulators, ensuring independent performance of each task and inspecting the operation, automatic changeover from one process mode to another according to a given program, automatic restoration of operations after failure in the control system or shutdown of a manipulator, and automatic spacing of electrodes after start of operation, also automatic regulation of liquid level, electrolyte temperature and concentration, current density, and draft in lateral exhaust pipes. Figures 2.
[243-2415]

UDC 621.318.3.002.2

PROGRESSIVE TECHNOLOGICAL PROCESSES IN PRODUCTION OF ELECTROMAGNETIC YOKES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 28 Apr 83) pp 37-38

BABUSHKIN, R.A., engineer, KOPYLOV, S.I., engineer, SDOBIN, V.A., engineer, and AL'PEROVICH, G.B., candidate of technical sciences, VPTIelektro (All-Union Design Engineering Institute of Electrotechnology)

[Abstract] Series EU d.c. electromagnets are produced in eight sizes with pull force ratings from 4 to 100 N. Yokes and flanges for these electromagnets are made of grade-20880 magnetically soft steel, by wasteful and laborious cutting methods. Several progressive technological processes have, therefore, been developed by the All-Union Design Engineering Institute of Electrotechnology which will reduce both the waste of metal and the labor content of forming operations. These processes, all involving plastic precision forming, are: cold extrusion, semihot extrusion, and circular stamping. Cold extrusion in a 6.3 MN hydraulic press follows turning of blanks on an automatic lathe, parkerization, saponification and, most importantly, lubrication. The force necessary for plastic deformation is 2-3 times lower in semihot (600-800°C) extrusion. At temperatures above 400°C the phosphate coating burns out and becomes an abrasive, whose action is best compensated by Sulfidol lubricants with excellent adhesive and antifriction characteristics. Circular stamping is the best method for producing flanges, with the punch in circular motion while it moves down at some angle to the vertical. This process requires an even smaller force for plastic deformation, only 0.8 MN for the flanges of size-6 electromagnets. Figures 1; tables 1. [243-2415]

UDC 621.313.333.2.043.3.002.2.004.18

OUTLOOK FOR IMPROVING ECONOMY OF MATERIALS AND ENERGY THROUGH IMPROVEMENT OF TECHNOLOGY OF PRESSURE-DIE CASTING OF ROTORS

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 3 May 83) pp 40-42

REBENKO, V.A., candidate of technical sciences, ABRAMOV, G.S., candidate of physico-mathematical sciences, STOMA, E.F., engineer, and LEYFEROV, V.A., engineer, VNIITelektromash (All-Union Scientific Research Institute of Electrical Machine Manufacture)

[Abstract] Mass production of induction-motor rotors with aluminum squirrel cages by the pressure-die casting process is analyzed from the standpoint of motor design and aluminum characteristics. Any improvement of the casting technology can be oriented toward maximizing the electrical conductivity of the raw metal and minimizing the porosity of the cast material. The first goal is achieved by using aluminum grades A5Ye and A7Ye with a

guaranteed electrical conductivity of 35.5-36 MSM/m. For the purpose of reaching the second goal, a model study of porosity buildup in cast aluminum was made and its results then verified at the All-Union Scientific Research Institute of Electrical Machine Manufacture. Initial gaseous porosity and additional shrinkage porosity were both considered, with emphasis on the dependence of the resultant porosity on casting pressure, gate width, areas of lateral bar and end ring surfaces, initial mold temperature, and aluminum pouring temperature. The data reveal that the porosity decreases with increasing casting pressure in a hyperbolic relation. Increasing the gate width up to 2 mm decreases the porosity of front end rings more than that of back end rings. Increasing it beyond 2 mm does not significantly change the porosity of bars and back end rings, but continues to decrease the porosity of front end rings until the gate width is 10 mm. Increasing the lateral end ring surface decreases the end ring porosity to a limited extent. Lowering the end ring mold temperature decreases its porosity regardless of the gate width, but with the maximum thus attainable decrease of porosity depending on the gate width. The porosity of all cage elements does not depend on the aluminum pouring temperature. On the basis of these conclusions, both the design of 4A90LA rotors and the casting process including the mold design have been optimized with respect to the aluminum economy and motor efficiency. This also required eventual redesign of the state winding, which yielded an additional copper saving without reduction of running efficiency and starting torque. References: 3 Russian.
[243-2415]

UDC [621.365.5:621.3.017].001.24

METHODS OF REDUCING AND UTILIZING ENERGY LOSSES IN INDUCTION EQUIPMENT

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 1 Jun 83) pp 42-45

KUVALDIN, A.B., candidate of technical sciences, and SAL'NIKOVA, I.P., engineer, MEI (Moscow Order of Lenin Power Engineering Institute); KOLBE, E., professor, doctor, and SEEBER, H., engineer, Ilmenau Polytechnic Institute (GDR)

[Abstract] Reduction and utilization of energy losses are two ways to economize the energy in induction heating and smelting equipment. Both approaches were studied at the Moscow Order of Lenin Power Engineering Institute with collaboration of the Ilmenau Polytechnic Institute (GDR). The conclusions of this study are that electrical losses in inductors can be reduced by modification of three groups of parameters characterizing the inductor-charge system. Improving the parameters of the charge and the parameters on which the inductor-charge coupling coefficient depends is limited by the maximum attainable efficiency of conventional water-cooled heaters. The inductor parameters on which electrical losses depend are the winding pattern and the electrical resistivity, a multilayer winding being more efficient and the electrical resistivity being most effectively reduced by cryogenic cooling. Utilization of energy losses by tapping and recirculation of lost

heat becomes more effective with higher coolant temperature. The 60°C limit on water for space heating can be raised to nearly 100°C to allow higher current density in the inductor and higher surface power density in the charge, or other cooling media can be used at 120-160°C, with an attendant cost increase as well as problems of temperature stabilization and tradeoff against higher electrical resistivity. New methods of inductor cooling developed and testing in the GDR are adiabatic cooling with cold moist air, applying the principle of a thermosiphon, and applying the principle of a heat pump. The last method is both technically and economically most promising. Figures 6; references 6: Russian, 4 East German.

[243-2415]

UDC 621.365.46:644.1

INFRARED ELECTRIC HEATING - ONE WAY TO ECONOMIZE ENERGY RESOURCES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 21 Sep 83) pp 45-46

SLOBODSKOY, A.P., candidate of technical sciences, KOVALEV, A.Ye., candidate of technical sciences, and BERZIN, V.A., candidate of technical sciences, VNIIETO (All-Union Scientific Research Institute of Electrothermal Equipment)

[Abstract] Infrared electric heating is considered as an economical method of moderate local space heating. The peculiar characteristics of infrared sources and radiative heat transfer produce several advantages over conventional convective heating. Firstly, the human comfort level is reached without raising the ambient temperature. Secondly, the installed heater power is proportional to the heated surface area rather than to the heated volume and the number of air turnovers. Thirdly, radiant heat can be focused with minimum leakage loss. Fourthly, the infinitesimal thermal lag of infrared sources facilitates automatic control for minimum wasteful expenditure of energy. All these advantages can be quantified on the basis of semiempirical relations. A comparative evaluation of infrared heating and central heating, in the typical case of a factory operating in one, two, or three shifts, illustrates the saving of primary energy sources (fuel). It is therefore recommended that more extensive scientific research and experimental engineering be done toward development and installation of infrared electric space heating systems. Figures 1; tables 1; references: 2 Russian.
[243-2415]

UDC [621.3.035.82:621.375.121].001.3

HELICAL WIDEBAND FILTER FOR INTERFERENCE SUPPRESSION IN CONVERTING DEVICES

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 18 Aug 83) pp 49-51

PCHEL'NIKOV, Yu.N., doctor of technical sciences, professor, Moscow Institute of Electronic Machine Design

[Abstract] A wideband filter of helical structure is proposed for suppression of electromagnetic interference in microwave converters. Helically wound turns with semiconductor coating are most efficient with a minimum space requirement because of nonselective absorption characteristics. An appreciable slowdown is attainable not only at high frequencies but also at low frequencies, and it can be further increased by placement of the helix inside a metal shield with longitudinal slots. Such a shield increases the interturn capacitance without affecting the inductance. The performance of the filter is calculated on the basis of an equivalent infinitesimally thin anisotropically conducting hollow cylinder. The attenuation coefficient and the dispersion equation are determined, whereupon design formulas are derived in the approximation of relatively high frequencies. Typical numerical data indicate the feasibility of small absorption-type filters with magnetic shields. Figures 1; references 3: 2 Russian, 1 Western (in Russian translation).
[243-2415]

UDC 621.039.637.015.33.001.24

CALCULATION AND OPTIMIZATION OF PARAMETERS OF HIGH-POWER CAPACITIVE ENERGY STORING DEVICES WITH PULSE DISCHARGE INTO RESISTIVE LOAD

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 18 Aug 83) pp 51-54

KUBAREV, L.P., candidate of technical sciences

[Abstract] The performance of capacitive energy storing devices as high-power generators of pulse voltages or currents is analyzed by the conventional method of a series equivalent circuit with resistive load. For the purpose of design and optimization, the conventional relations for pulseform parameters and energy are reduced to dimensionless form. Calculations on this basis reveals the optimum ranges of capacitance and inductance depending on specific requirements such as maximum energy transfer, minimum voltage fall, minimum rise time, or combinations of requirements. The design optimization procedure, with aid of curves and tables, is demonstrated on a typical example of selecting commercially available components (capacitor). Figures 6; tables 3; references: 2 Russian.
[243-2415]

UDC 621.313.322-81.013.1

EFFECT OF COPPER SHIELD ON ELECTROMAGNETIC AND THERMAL PROCESSES IN STATOR END ZONE OF 500 MW TURBOGENERATOR

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 (manuscript received 11 Apr 83) pp 55-57

BITYUTSKIY, N.L., engineer, DERZHAVINA, A.Yu., candidate of technical sciences, KAPLUNOV, V.B., candidate of technical sciences, LITSOV, V.I., engineer, and YAKOVLEV, V.I., candidate of technical sciences

[Abstract] The effect of a copper shield in a turbogenerator on the two iron end stacks and retaining plates of the stator, in terms of electromagnetic and thermal characteristics, is evaluated on the typical example of a 500 MW - 3000 rpm machine. The stator and rotor end windings are regarded as the sole sources of the electromagnetic field in this zone, radial and axial components of the magnetic vector potential are disregarded, radial and axial components of eddy currents in the plate are disregarded, fringing at the air gap is accounted for in stipulating the distribution of the radial component of magnetic induction, and the current density as well as the magnetic vector potential are assumed to vary periodically around the circumference. The electromagnetic field distribution under load and the axial component of magnetic induction in the end zone were calculated by numerical solution of the second-order partial differential equation for the tangential component of the magnetic vector potential in cylindrical coordinates. The distribution of temperature excess over the plate surface was determined experimentally under load, with and without shield. The results indicate that a copper shield reduces the total losses in a nonmagnetic retaining plate substantially, by decreasing the eddy current. It decreases the temperature rise at the bore of the plate by approximately 25°C and increases the temperature at the periphery of the plate by approximately 15°C, which is permissible. Figures 4; references: 5 Russian. [243-2415]

UDC: 389.14:621.317.7:681.3

METROLOGICAL SUPPORT FOR INFORMATION-MEASUREMENT SYSTEMS FOR ANALYZING PARAMETERS OF RANDOM SIGNALS

Moscow METROLOGIYA in Russian No 6, Jun 84 pp 3-12

KOLTIK, Ye. D. and MUGINOVA, G. D.

[Abstract] Estimation of the errors of information-measurement systems used to analyze random signals is discussed. The structural diagrams of typical information-measurement systems are presented. Element-by-element, complex and complex element-by-element procedures for estimating measurement system errors are outlined. The test signals employed in estimating measurement-computer complex errors are discussed. Facilities for estimating information-measurement system errors are described. The problems and prospects for metrological support are discussed. Figures 2; references 12: Russian.
[298-6900]

UDC: 681.7:621.39:629.7

MEASUREMENTS OF POLARIZATION CHARACTERISTICS OF RADIATION FIELD OF ON-BOARD AIRCRAFT ANTENNAS

Moscow METROLOGIYA in Russian No 6, Jun 84 pp 44-49

GAZAZYAN, E. D. and PANCHENKO, V. G.

[Abstract] A method for measuring the polarization characteristics of on-board antennas is analyzed in which an aircraft following an assigned trajectory is tracked from the ground and its angles of evolution with respect to the center of mass and the signal parameters at the output of the master antenna on the ground are measured. It is determined that rectilinear horizontal trajectories with no pitch or roll of the vehicle should be used. The requirements for the pitch and roll transducers must be made stiffer when selecting angle of measurement means; methods based on measuring amplitude ratios should be used when selecting a method for measuring the polarization characteristics of on-board antennas with arbitrary polarization. Figures 2; references: 3 Russian.
[298-6900]

UDC: 621.317.341

SPECTRAL NOISE DENSITY AND RANDOM ERRORS OF PULSE FREQUENCY CHARACTERISTIC METERS

Moscow METROLOGIYA in Russian No 6, Jun 84 pp 50-56

PURTOV, A. V. and KRSHEMINSKAYA, Ye. V.

[Abstract] Formulas are derived for estimating the errors of automated pulse-reflectometer systems for measuring the frequency and phase characteristics of microwave components. The factors influencing errors in measuring the coefficient of transmission or reflection are analyzed. Sweep instability noise is investigated on the basis of a stroboscopic convertor consisting of a sample-and-store device which forms a stairstep signal from a periodic sequence of pulses under the influence of gaping pulses applied to the switch in a particular order. The energy characteristics of the output noise are examined; the energy spectral characteristics of the process of the output of the convertor are studied. The required accuracy can be obtained in automated pulse-reflectometer systems by additional digital processing of the signals from a gating oscilloscope in the time or frequency domain. Figures 3; references 6: 5 Russian, 1 Western.
[298-6900]

UDC 537.212.001.24

QUESTION OF NUMERICAL METHODS OF SOLUTION OF EXTERNAL BOUNDARY-VALUE PROBLEMS OF ELECTRICAL FIELD

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 84 (manuscript received 25 May 82) pp 5-11

IVANOV, VALENTIN TIMOFEYEVICH, Doctor of technical sciences, professor; and NEKHAYEVA, GALINA NIKOLAYEVNA, graduate student, Bashkir State University

[Abstract] An effective method is presented for an approximation by means of interior problems of external boundary-value problems of electrical fields. These methods are suitable for numerical calculations accepted by an electronic computer. The following items are considered: 1) Mathematical statement of the boundary-value problems; 2) Approximation of second external boundary-value problem of the electrical field; 3) Approximation of first, third, and mixed external boundary-value problems of electrical field; and 4) Proof of approximations by numerical experiments (two examples). Figures 4; references: 8 Russian.
[297-6415]

UDC: 537.533

APPROXIMATE ANALYTIC SOLUTION OF PROBLEM OF FORMATION OF RELATIVISTIC ELECTRON BEAM IN COAXIAL DIODE IN PRESENCE OF VARIOUS INSULATING MAGNETIC FIELDS

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 6 Jun 83) pp 628-634

NECHAYEV, V. Ye., Institute of Applied Physics, USSR Academy of Sciences

[Abstract] The formation of a relativistic beam of electrons in a magnetically insulated coaxial diode is examined by an averaging method which is modified to make it possible to examine electron movement in static weakly heterogeneous E- and H-fields and to allow for relativism. Analysis of the characteristics of the formed relativistic electron beam shows that as the magnetic field decreases the current increases to a level which is still lower than the limiting transport current; the longitudinal velocity and energy of the electrons becomes smaller, while the transverse oscillations and rotational pulses grow. Figures 3; references: 8 Russian.
[294-6900]

UDC: 537.31.33:538.221

NONLINEAR ELECTROMAGNETIC WAVES IN FERROMAGNETIC CONDUCTING MEDIA

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 31 May 83) pp 642-654

BASS, F. G. and NASONOV, N. N., Institute of Radio Physics and Electronics, Ukrainian SSR Academy of Sciences

[Abstract] Highly nonlinear electromagnetic waves in ferromagnetic semiconductors are investigated. Unidimensional periodic and a single circularly polarized waves propagating along a constant magnetic field in an isotropic medium are examined. The analysis is performed within the framework of a hydrodynamic description of the conductivity plasma. The magnetization dynamics are described by a Landau-Lifshits equation disregarding heterogenous exchange. Waves with and without drift of the charge carriers are studied. A general analytical solution to the problem of the propagation

of a nonlinear monochromatic wave in a conducting ferromagnet is derived. Stationary waves of envelopes in ferromagnets with drift of the charge carriers are examined. Figures 2; references 31: 27 Russian, 4 Western (2 in Russian translation).
[294-6900]

UDC: 621.372.8

NUMERICAL INVESTIGATION OF DIFFRACTION MODELS OF MICROWAVE INTEGRATED CIRCUITS

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 14 Jul 83) pp 669-674

NIKOL'SKIY, V. V. and NIKOL'SKAYA, T. I., Moscow Institute of Electrical Engineering, Electronics and Automation

[Abstract] A stripline stub on a "suspended" substrate is examined. The multimode scattering matrices of the two identical jumps picking up the stub are determined by projection "sewing" of the systems of intrinsic waves of the narrow and wide lines. The multimode scattering matrix of the stub is found by combining the scattering matrices of the two jumps with allowance for an intermediate segment of regular line with a wide conductor. Two algorithms are constructed, one of which finds the intrinsic waves of the strip lines by solving an integral equation for the current density on the stripline conductor (impedance version) and the other formulates the integral equation with respect to the tangential electrical field in the boundary region (admittance version). It is found that the higher harmonics in Trefftz bases have little influence on the characteristics obtained for the fundamental wave. Figures 16; tables 1; references: 2 Russian. [294-6900]

UDC: 621.385.6

GENERATION OF SUPERPOWERFUL MICROSECOND ELECTROMAGNETIC RADIATION PULSES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 29 Jun 83) pp 994-996

BUGAYEV, S. P., KANAVETS, V. I., KLIMOV, A. I., KOSHELEV, V. I., KHRYAPOV, P.A. and CHEREPENIN, V. A.

[Abstract] The findings from investigations of a multi-mode Chernekov oscillator producing an elongated microwave pulse are presented. The power distribution of the electromagnetic radiation in the plane of the output aperture of the experimental device is analyzed. The power and pulse length

are found as a function of the inductance of the magnetic field. It is shown that the length of the microwave pulse is limited by high-frequency breakdown of the delay structure as well as by nonlinear effects occurring when the electron beam interacts with multiple modes of the electromagnetic field. The authors thank A. N. Bastrinkov and K. N. Sukhushin for assistance in the work. Figures 3; references: 5 Russian.
[295-6900]

UDC: 621.385.6.029.6:621.314

OPTIMIZATION OF PARAMETERS OF MICROWAVE ENERGY CONVERTERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 30 May 83) pp 996-1000

ANAN'YEV, L. L., BORISOV, D. A., SAZONOV, Ye. A., and FURSEY, G. N.

[Abstract] An autoemission converter for converting microwave energy to direct current is examined. The operating principle of the converter is based on tunneling of the electrons from a metal in a vacuum under the influence of a strong electrical field. The efficiency of the converter is defined as the ratio of the dc power released into the load to the input microwave power. The Q-factor of the resonator and the efficiency of electron conversion are analyzed as a function of the input microwave power. Ways for improving the efficiency of autoemission converters are outlined. It is shown that there are optimal values of the radius of the point and number of points of the autoemission cathode of the converter. Figures 3; tables 1; references: 6 Russian.
[295-6900]

UDC: 53:51

SCATTERING OF ELECTROMAGNETIC WAVES IN FLAT WAVEGUIDE WITH BILATERAL DIAPHRAGMS

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 15 Aug 83) pp 865-872

LUK'YANOV, V. D. and NIKITIN, G. L.

[Abstract] The propagation of stationary electromagnetic waves (scalar problem) in an infinite flat waveguide with a bilateral diaphragm is examined. The walls of the waveguide and the transverse diaphragm are conductors with infinite conductivity. An exact solution is derived for the problem of stationary scattering of a normal wave by reduction to a Riemann matrix problem for two pairs of analytical functions. The second-order matrix function is factored in closed form. Expressions are derived for the coefficients of refraction and transformation of the incident normal wave.

It is found that the solution of the problem is analogous to the case in which the Neumann boundary condition is satisfied at the boundary of the waveguide. Figures 4; references 10: 6 Russian, 4 Western (1 in Russian translation).
[304-6900]

UDC: 538.566

INVESTIGATION OF TYPE H:$LiTaO_3$ OPTICAL WAVEGUIDES

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 21 Jun 83) pp 977-979

ATUCHIN, V. V. and ZAKHAR'YASH, Institute of Semiconductor Physics, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] Z-cut $LiTaO_3$ waveguide layers are obtained through an ion exchange reaction in a benzoic acid melt. The stability of the increment and index of refraction at elevated temperatures is investigated. The experiment was conducted with polished specimens of Z-cut $LiTaO_3$ with dimensions of 10 x 15 x 1 mm along the x, y and z axes. Optical measurements indicate that only the extraordinary index of refraction increases when $LiTaO_3$ interacts with benzoic acid. The subject waveguides are found to be unstable at temperatures of about 460°C. Figures 2; references 11: 2 Russian, 9 Western.
[304-6900]

UDC: 621.382.8

RESISTS FOR DRY MICROLITHOGRAPHY

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 19 Apr 83) pp 291-301

SELIVANOV, G. K., MSHENSKAYA, T. A., MOZZHUKHIN, D. D. and GRIBOV, B. G.

[Abstract] Published findings from research on the composition and properties of photoresists, electron resists and X-ray resists for dry application and developing and for completely dry microlithography cycles are reviewed. Methods for applying films of liquid resist compositions on substrates are outlined. Heat-sensitive resists, plasma-sensitive resists and self-developing resists are described. Most resists for dry microlithography are still undergoing laboratory testing. The problems of ensuring uniformity over the field of the board and reproducible results remain to be solved. Figures 5; tables 4; references 42: 10 Russian, 32 Western (1 in Russian translation).
[303-6900]

UDC: 621.382

MODELING OF PROCESSES OCCURRING IN RESISTS DURING ELECTRON-BEAM EXPOSURE

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 1 Jul 83) pp 302-310

DERKACH, V. P., KORSUNSKIY, V. M. and STARIKOVA, L. V., Institute of Cybernetics, Ukrainian SSR Academy of Sciences

[Abstract] An approach to calculating the energy released by electrons throughout the body of the resist and the three-dimensional distribution of the concentration of radiation-chemical transformations is presented. A package of applications programs for computation and extraction of various "latent image" information is described. Formulas are presented for the aforementioned distributions. A package of FORTRAN programs which runs on a BESM-6 computer is described. The approach and programs can be used effectively for quantitative investigation of image formation characteristics in electron resists under various electron-beam exposure conditions, and to estimate distortions in the exposed pattern as a function of the substrate material, the thickness of the resist, the radiation density, the accelerating voltage, etc. The modular construction of the applications program package allows it to be adapted to various shapes of exposed figures. Figures 6; tables 1; references 13: 4 Russian, 9 Western.
[303-6900]

UDC: 621.382

INVESTIGATION OF SENSITIVITY OF METAL METHYLMETHACRYLATE COPOLYMERS WITH METHACRYLIC ACID TO SHORTWAVE ULTRAVIOLENT RADIATION

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 4 Apr 83) pp 311-314

VAYNER, A. Ya., YAKIMENKO, A. N., LIMANOVA, V. F., DYUMAYEV, K. M., RUBTSOV, I. N. and UL'YANOV, V. V.

[Abstract] Photoresists based on methylmethacrylate (MMA) copolymers with methacrylic acid (MAK) are described. The MMA-MAK copolymers are obtained by partial hydrolysis of commercial brand LSOM polymethylmethacrylate (PMMA) in concentrated sulfuric acid. Experiments indicate that the introduction of carboxyl groups in PMMA increases its sensitivity to short-wave ultraviolet radiation, with the extent of the effect depending upon the MAK concentration in the copolymer and the regularity of the distribution along the polymer chain. Photoresists based on MMA-MAK copolymers are found to have greater sensitivity to shortwave ultraviolet exposure than PMMA; the sensitivity can be increased by adding aromatic fragments to the photoresist. The other technological properties of the photoresist are analogous to the corresponding parameters of PMMA, permitting MMA-MAK copolymers to be employed in the manufacture of semiconductor devices. References 13: 2 Russian, 11 Western.
[303-6900]

UDC: 621.382

COMPARATIVE ANALYSIS OF DYNAMIC CHARACTERISTICS OF BASE ELEMENTS OF DIGITAL INTEGRATED CIRCUITS BASED ON GaAs, InP AND Si AT 300 AND 77K TEMPERATURES

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 27 Jan 84) pp 315-323

BUYANOV, N. N. and PASHINTSEV, Yu. I.

[Abstract] The behavior of the electrophysical parameters of GaAs, InP and Si digital integrated circuits at reduced temperatures is investigated within the framework of the organizational problem of finding the minimum signal propagation delay for a given power consumption and restrictions on the threshold and output voltages. A set of analysis programs for optimizing digital integrated circuits is described. It is found that the same speed ratio holds between Si and GaAs circuits as occurs at room temperature for fixed transistor dimensions. Dynamic characteristics are compared for a fixed switching transistor width. It is suggested that the speed difference of silicon integrated circuits based on bipolar and field effect transistors will become significantly smaller as the devices become smaller and as manufacturing technology improves. Figures 4; tables 1; references 12: 5 Russian, 7 Western.
[303-6900]

UDC: 621.382

SOME CHARACTERISTICS OF STORAGE ELEMENTS BASED ON SUPERCONDUCTING QUANTUM INTERFEROMETER

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 27 Oct 83) pp 330-336

MASLOVA, L. A. and CHENTSOV, R. A.

[Abstract] A prototype 16 kbit memory microcircuit with an excess time of 15 nsec and a heat release of 40 μW in the active mode based on a dual-junction Josephson quantum interferometer is described. The schematic diagram of the interferometer is presented and analyzed. Equations are derived for the dynamic properties of the interferometer. The relationship between the critical point K and the junction capacitance and interferometer inductance is analyzed. The influence of nonlinearity of the quasi-partial current is discussed. The formulas derived can be used to calculate the characteristics of specific memory elements. The elements described can employ Josephson tunnel junctions with enhanced critical current density, in which case the tolerances for the control currents are as good as those for an interferometer with parameters of $\lambda \approx \gamma, \beta \approx 160$. The author thanks V. N. Andratskom for helpful discussions. Figures 5, references 14: 1 Russian, 13 Western.
[303-6900]

UDC: 621.382

DETERMINATION OF ANISOTROPY CONSTANT OF EPITAXIAL FERRITE-GARNET FILMS WITH DIFFERENT CRYSTALLOGRAPHIC ORIENTATION BY PHASE TRANSITION METHOD

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 13 Jul 83) pp 337-347

DIKSHTEYN, I. Ye., LISOVSKIY, F. V., MANSVETOVA, Ye. G., TARASENKO, V. V.

[Abstract] A rigorous theory is developed for orientation phase transitions in films with differing crystallographic orientation; analytical formulas are derived for determining all of the parameters characterizing the anisotropy of the investigated objects. Anisotropy constant measurements are made for $(YGdYbBi)_3(FeAl)_5O_{12}$ films grown on $Gd_3Ga_5O_{12}$ substrates with orientation $\{111\}$, $\{110\}$ and $\{100\}$. The temperature behavior of uniaxial, rhombic and cubic anisotropic constants is investigated. The authors express their thanks to I.G. Avayev and L. M. Filimonov for growing and giving of films. Figures 5; tables 1; references 8: 2 Russian, 6 Western. [303-6900]

UDC: 621.382:681.14-32

FUNCTIONAL CHECKING OF MICROPROCESSORS AND MICROPROCESSOR SYSTEMS

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 10 Jun 83) pp 356-366

ARUTYUNOV, P. A. and GOMANILOVA, N. B., Moscow Electronic Machine Construction Institute

[Abstract] The problem of metrological support for large scale integrated microprocessor circuits and microprocessor systems is considered from the viewpoint of a hierarchical functional checking and diagnostic system consisting of three levels: physical, circuitry and system. Modern methods of testing and diagnosing microprocessor and microprocessing system malfunctions are compared; promising directions in the development of checking and diagnostic methods are examined, and examples of checking and diagnostic equipment are presented. Analysis of existing methods and means for checking large scale integration microprocessors points up the unsuitability of traditional approaches which disregard the architecture, circuit engineering and system engineering of the object checked. Microprocessor and microprocessor checking is facilitated by incorporating devices in their architecture to assure checkability at the physical, circuitry and system levels. Figures 3; references 55: 28 Russian, 27 Western (2 in Russian translation). [303-6900]

UDC: 621.382.8

CIRCUIT ENGINEERING AND TECHNOLOGICAL OPTIMIZATION OF VERY HIGH SPEED LSI LOGIC ELEMENTS AND TRANSISTOR STRUCTURES

Moscow MIKROELEKTRONIKA in Russian Vol 13, No 4, Jul-Aug 84 (manuscript received 7 Jan 83) pp 367-375

BUBENNIKOV, A. N., Moscow Physical-Chemical Institute

[Abstract] The possibilities and prospects of adapting the structural and technological parameters of transistor structures to the power consumption of logic elements and of concurrent current circuit engineering and technological optimization of logic elements and transistor structures employing subnanosecond bipolar LSI and VLST circuits manufactured using present-day technology are examined. It is found that concurrent optimization makes it possible to achieve better VLST circuit use from the viewpoint of the level of circuitry and base technological implementation achieved. Adaptation of the structural and technological parameters of a transistor structure manufactured by the base technology to the power consumption of the logic elements make it possible to achieve maximum speed. Figures 6; references 18: 13 Russian, 5 Western.
[303-6900]

UDC (62.68:697.3)0.03.1

TIMELINESS OF DIRECTIONS FOR USE OF SECONDARY THERMAL POWER RESOURCES (SECONDARY ENERGY RESOURCES)

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 3, Mar 84 (manuscript received 16 Jun 83) pp 57-61

KOLOBKOV, P. S., honored scientist of the Ukrainian SSR, doctor of technical sciences, professor; FILIP'YEV, O. V., doctor of technical sciences, professor; and KUTS, G. A., candidate of technical sciences, Kharkov Engineering-Construction Institute

[Abstract] The quantity of low-potential secondary energy resources (SER) in the form of cooling water with a temperature below 70°C and exhaust gases below 200-300°C is sufficiently large. At present, their use is given much attention, mainly at the stage of a study of combining gas-water, water-air-apparatuses. The principal question examined in this paper--the consumption and economic advisability of using such fuel--requires a clear definition, which might considerably restrict the expected possibilities. Under consumers of heat, of course, are included hot water supply (HWS), heating, ventilation, and air conditioning (HV and AC). In the domain of HV and AC large possibilities exist for saving energy, including regeneration of the heat of ventilation. Preparation of engineers concerned with "heat supply", ventilation (with generation of heat) and use of SER is organized at the Kharkov Engineering-Construction Institute. Organization of an educational-advisory center for engineerings working in the given domain would also be helpful. The problem of optimum use of SER and thermal power equipment must only be resolved comprehensively, for industrial units as a whole, in the form of a general system of interaction of sources and consumers of fuel where each of them occupies their best and set place. In so doing, saving of fuel (primarily natural gas) will be maximum and it is possible very significant. The paper concludes that use of the heat of cooling water without an increase of its temperature, and water from blending of heat exchangers to waste gas, relates to particular cases, quantitatively insignificant and has serious deficiencies. One must not overrate use by turbines based on SER steam as a general course: it is expensive, impracticable (first of all with respect to steam pressure, and because of this of relatively small significance. The electrical power use of SER is advisable in isolated cases. There are many SER of sufficiently high potential, which at an optimum it is possible to use with high profitableness for

technological needs and heat supply of buildings. This is necessary to consider as a priority problem. A drop of the calculated temperature of direct water for HV and AC systems with use of SER is only justified in isolated cases. The opposite is more frequent. The paper was presented by the Heat Supply and Ventilation Department Faculty of the Kharkov Engineering-Construction Institute. Figures 1; references 7: all of them are principally the work of L.S. Kolobkov.
[288-6415]

UDC 621.311.21

FEATURES OF AFRICAN HYDRAULIC POWER ENGINEERING

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 3, Mar 84 (manuscript received 11 Oct 83) pp 119-123

DERZHKO, M.V. and KAMINSKIY, P.V., candidates of technical sciences, docents; AKOMPI, S.K., candiate of technical sciences, Lvov Order of Lenin Polytechnic Institute imeni Lenin Komsomol; Ghana, Control of Electrical Networks

[Abstract] Data are considered concerned with the following aspects of African hydraulic power engineering: 1) Power industry of African countries in 1978; 2) Growth of electric power production and installed capacity in Africa from 1963 5o 1990; 3) Principal characteristics of the largest African rivers; 4) Map showing placement of hydroelectric power stations and water storage power plants in Africa; and 5) Parameters of principal water power and electrical equipment of contemporary African hydroelectric power stations and water storage plants. Figures 2; tables 3; references 4: 1 United Nations report in English; 3 Western items in Soviet translation.
[288-6415]

UDC 662.69

EFFECTIVE USE OF SECONDARY POWER RESOURCES

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 3, Mar 84 (manuscript received 24 Mar 83) pp 123-125

KOZHEVNIKOV, A.A., candidate of technical sciences, docent, Penza Construction-Engineering Institute

[Abstract] Secondary power resources (SPR) are economically advantageous and are technically advisable for use in extraction of carbonic acid gas from flue gases, acquisition of hot water for heating, household and industrial hot water supply, and degreasing of the liquid discharge of stock-rearing farms with the object of organizing a circulating water supply, as well as for increasing the efficiency of heating, of production boilers, electric power stations and heating and power plants. The effectiveness of using SPR

is constantly increased by use of the heat of condensation of the water vapors of flue gases, i.e., utilization of the latent heat of evaporation. A surface contact gas water heater developed for such utilization is illustrated and explained, as well as the flow chart of a device for separating CO_2 from flue gases and obtaining 75-90°C hot water with the use of the surface contact gas water heater. The flow chart is shown of a device for feeding make-up water into a heat-supply system with a surface contact gas water heater installation. The paper was presented by the Electric Power Stations Department Faculty of the Penza Construction-Engineering Institute. Figures 3; references: 4 Russian.
[288-6415]

UDC 621.311.4

OPTIMIZATION OF DIMENSIONS AND POSITION IN CYLINDRICAL ENCLOSURE OF HIGH-VOLTAGE METALLIC SCREENS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 5, May 84 (manuscript received 25 Feb 83) pp 28-32

KOLECHITSKIY, Ye. S., candidate of technical sciences, docent; and YELISEYEV, Yu. V., engineer, Moscow Order of Lenin and Order of the October Revolution Power Engineering Institute

[Abstract] In power engineering, electrical engineering, and in the practice of scientific investigations, employment has increased of units, the high-voltage part of which is placed inside a closed cylindrical enclosure filled with compressed gas. In order to reduce the nonuniformity of the electrical field around the high-voltage parts of such constructions (pulse-voltage generator, elements of open distributing device, accelerator of electrons), metallic screens are installed, the form and dimensions of which proceed from the fact that the magnitude of the maximum field intensity on the surface of the screen E_{max} must not exceed the value of the permissible intensity E_{perm} for the environment within the enclosure. In the present work, for spherical, toroidal, and cylindrical screens with rounded edges, calculations obtained by means of the dependence of E_{max} on the dimensions of the screen and its position in the enclosure are presented. A description of the calculating method, and the design of the metal screens are given. The paper was presented by the High-Voltage Procedure Department Faculty of the Moscow Power Engineering Institute. Figures 3; references: 12 Russian.
[287-6415]

UDC 621.311.52

AUTOMATIC CONTROL REGIME OF POWER SYSTEM WITH RESPECT TO VOLTAGE UNDER CONDITIONS OF EMERGENCY DEFICIENCY OF REACTIVE POWER

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 5, May 84 (manuscript received 27 Oct 82) pp 44-46

KALENTIONOK, Ye. V. and FAYBISOVICH, V.A., candidates of technical sciences, Belorussian Order of Labor Red Banner Polytechnic Institute

[Abstract] With respect to voltage, the operational control regime of power systems plays a large role in emergency situations when, because of a loss of reactive power sources or detachment of electrical power lines, the voltages in many units is reduced to values critical with respect to stability of conditions or serviceability for users. The present paper shows that the off-loading of users to provide minimum allowable voltage levels under conditions of an emergency deficiency of reactive power must be performed by a method which assures a minimum number of disconnections. For open power supply circuits the minimum number of disconnections is attained by discharges beginning with units having the lowest voltage levels. In closed circuits it is found that the algorithm proposed in the paper is close to optimum. Calculations made on an electric computer for a number of power supply circuits confirmed its efficiency. The algorithm is realized in the form of local off-loading devices which have a delay time dependent on voltage. They are installed in several units of the Belorussian power system. The paper was presented by the Power System Department Faculty of the Belorrussian Polytechnic Institute. Figures 2; references: 4 Russian. [287-6415]

UDC 621.224.01

CONCERNING ALLOWANCE IN TECHNICAL-ECONOMIC CALCULATIONS FOR GROWTH DYNAMICS OF WATER POWER AND COMPLEX HYDROECONOMIC OBJECTS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 5, May 84 (manuscript received 26 Dec 83) pp 116-120

DOLGOV, P.P., doctor of economic sciences, professor; SEMENOV, M.V., candidate of technical sciences; and SHCHAVELEV, D.S., doctor of technical sciences, professor, Leningrad Order of Lenin Polytechnic Institute imeni M.I. Kalinin.

[Abstract] Water power and complex hydroeconomic objects are characterized by large capital investment and by comparatively long periods of time for construction and mastering of their designed capacity and productivity. Large water power and complex hydroengineering complexes are constructed in 5-10 years and their mastery is measured by several years. The present paper is concerned with how technical-economic calculations take into account the dynamics of growth of capital investments in the period of construction,

the annual costs per year in a period of time and their change in a period of constant exploitation. The power is introduced and there is an increase in the yearly output. It is concluded that the minimum index of the adduced expenditures with an identical effect determines the most advantageous economical version, both in the case of construction of an object in 1 year, and under conditions of construction in the course of several years, and the introduction of units in turn. Allowing for an increase of capital investments in the course of several years and annual changes in tome of the costs, the index of economic effectiveness becomes a minimum of the addressed dynamic expenditures. The possibility and necessity of creating an index of the comparative effectiveness of capital investments without retention of the structure of the adduced expenditures are required in a special substantiation. The paper was presented by the Use of Water Power Department Faculty, Leningrad Polytechnic Institute. References: 10 Russian.
[287-6415]

UDC 621.313.12.025. "313"

PROBLEMS IN CREATING POWERFUL HYDROELECTRIC MOTOR-GENERATORS FOR WATER STORAGE POWER PLANTS

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 84 (manuscript received 22 Dec 83) pp 23-26

GOL'DENBERG, S.I., LOSHKAREV, V.P., RASKIN, M.G., SHUR, G.I., EL'BERT, Ye.S., engineers; KARYMOV, A. A., and BRYNSKIY, Ye.A., candidates of technical sciences

[Abstract] The principal problems are considered which arose during creation of the unique hydroelectric motor-generators (MG) for the Zagorsk Water Storage Power Plant (WSPP). In addition, the means for solution of these problems are analyzed. The Ural Heavy Electrical Machinery (Uralelektrotyazhmash) Plant manufactured the prototype specimens of the MG for the Zagorsk WSPP. They were developed by the Design Department of the plant with participation of the All-Union Scientific-Research Institute of Electrical Machines. The principal technical data of the MG are:

Power in generator regime, MV.A/MW	236/200
Power in motor regime, MV.A/MW	236/220
Voltage, KV	15, 75
Rotation frequency, rated, r/min	150
Rotation frequency, driving, r/min	240
Moment of inertia of rotor, $T.M^2$	32,000
Cooling system	Air
Excitation system	thyristor, self-excitation circuit

Figures 3.
[298-6415]

UDC 621.314.21:62-83:621.382.233.026

PRINCIPAL CHARACTERISTICS OF NEW SERIES OF TRANSFORMERS FOR HIGH-POWER ELECTRIC THYRISTOR DRIVES

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 84 (manuscript received 14 Jul 83) pp 43-46

VINNIK, V.Z., ZBOROVSKIY, I.A., and FISHLER, Ya. L., candidates of technical sciences, Ural Heavy Electrical Machinery Plant Production Association

[Abstract] Measures are being taken in the 11th Five-Year Plan with respect to further perfection of transformers and reactors. The present paper lists a number of these new devices, and in particular describes the circuits and construction of the windings of a series of multiwinding converting transformers for high-power direct-current electric drives. A table presents the comparative characteristics of transformers with two active parts and the new transformers replacing them. The advantages of the new transformers are shown. Two tables list the parameters of transformers with two active parts. Three types of winding schemes are illustrated. Figures 3; tables 3; references: 6 Russian.
[298-6415]

UDC 621.314.222.6

DEVICE FOR INVESTIGATION OF STRUCTURAL ELEMENTS OF HIGH-POWER TRANSFORMERS DURING ACTION OF DYNAMIC AXIAL FORCES

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 84 (manuscript received 6 Oct 83) pp 46-50

LUR'YE, A.I., MIL'MAN, L.I., candidates of technical sciences; AFANAS'YEV, M.A., engineer; and IGONIN, G.V., candidate of technical sciences

[Abstract] The construction is examined of a universal electromagnetic device of type ROST (disruptive axial forces of a transformer). [Earlier ROST-M equipment was prepared and tested in order to verify the decisions taken, determine the course of investigations, build-up of the tests of the work, and creation of measuring methods. It represented a reduced version of the ROST.] The device is designed for estimation of the strength and stability of individual construction elements of power transformer units during the action of axial forces. The parameters of the device and a number of views of the ROST are presented. Some results are given of tests of models of the windings. Figures 8; tables 2; references 10: 9 Russian; 1 Western.
[298-6415]

UDC [621.317.42:621.317.385].001.4

INSTALLATION FOR TESTS OF APPARATUS IN MAGNETIC FIELD UP TO 6,000 A/m

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 84 (manuscript received 24 Jul 83) pp 59-61

KHAGEMEYSTER, Ye. A., GINOVKER, A.M., candidates of technical sciences, ZHOLOBOVA, L.A., engineer. Kirov Polytechnic Institute

[Abstract] Operation of power generators with stator currents on the order of 12-20 kA is accompanied by the formation of strong magnetic fields (MF) with an intensity of 200-1,000 A/m in the regime of a nominal load of the generator, and up to 5,000-6,000 A/m at the time of a transient process with a short circuit at the electric power station or in the vicinity of it. These MP exert a definite interference effect on the operation of apparatus for relay protection (RP), automatics (A), and measurements (M). Of the measuring instruments, located in the area of the generator, the most susceptible to the effect of the exterior MF are electric meters which find themselves constantly in MF, the intensity of which is determined by the nominal current of the generator. In order to investigate the effect of MF on the operation of RF, A, and M under laboratory conditions, a magnetic installation was developed and constructed at the Electric Power Station Department Faculty of the Kirov Polytechnic Institute. The circuit is shown of an installation for creation of a magnetic field with an intensity up to 6,000 A/m, and its operation is described. The authors consider it expedient to determine anti-interference as regards the external magnetic field of all RP, A, and M apparatus set aside for installations at power generators with stator currents of more than 12 kA. Figures 2; tables 1; references: 6 Russian.
[298-6415]

UDC 621.313.333.3.018

IMPROVEMENT OF METHODS FOR CALCULATION OF MECHANICAL VIBRATIONS OF LOW-POWER ASYNCHRONOUS ELECTRIC MOTORS AT THEIR DESIGN STAGE

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 84 (manuscript received 25 Jan 84) pp 39-45

ALIKHANYAN, KAREN ARTSVIKOVICH, candidate of technical sciences, senior scientific-associate director of Scientific-Research Institute of Electrical Machines (Yerevan)

[Abstract] Methods are presented for calculation of the low-frequency and high-frequency vibrations of low-power three-phase asynchronous electrical motors. Experiments and theoretical data are compared. Figures 3; tables 1; references: 4 Russian.
[297-6415]

UDC: 620.9

PROBLEMS OF DEVELOPMENT OF POWER ENGINEERING IN USSR

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 7, Jul 84 (manuscript received 27 Jan 84) pp 3-8

KOVALEV, N. N., corresponding member, USSR Academy of Sciences, and Chairman, Central Board, Scientific-Technical Society for Power Engineering and Electrical Engineering Industry imeni Academician G. N. Krzhizhanovskiy

[Abstract] The development of power engineering in the USSR is traced briefly from the inception of the GOELRO (State Plan for the Electrification of Russia) more than 60 years ago. By 1947 the USSR held first place in electricity production in Europe, and second place throughout the world. The main areas of technical progress in heat engineering are outlined. The role of hydroelectric plants and their contribution to total power production in the USSR are discussed. The construction of nuclear power-plants in the European part of the country is explored. The creation of the USSR Consolidated Electric Power System is discussed. The need for conservation and better use of secondary fuel resources is emphasized. References: 2 Russian.
[296-6900]

UDC: 621.316.13.016

INTEGRAL CHARACTERISTICS OF MODES OF POST-ACCIDENT CONDITIONS OF COMPLEX SYSTEMS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 7, Jul 84 (manuscript received 28 Dec 82) pp 19-25

FOKIN, Yu. A., candidate of mechanical sciences, docent, Moscow Order of Lenin and Order of the October Revolution Power Engineering Institute

[Abstract] Accelerated methods are proposed for converting integral mode characteristics for complex circuits by using generalized parameters of electrical circuits. The methods are based on the concept of change matrices of the modes characterizing the "deformation" of a circuit under the post-accident conditions. The methods developed can be used to predict the appropriate switching strategy for post-accident system conditions. The paper was presented by the Department Faculty of Electrical Systems of the Moscow Power Engineering Institute. Figures 1; references: 4 Russian.
[296-6900]

UDC: 621.391.823

IMPEDANCE OF CONDUCTOR-GROUND CIRCUIT IN CABLES CONSIDERING SHEATHING

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 7, Jul 84 (manuscript received 16 Aug 82) pp 33-37

IZMAYLOVA, L. I., engineer, Energoset'proyekt (All-Union Planning, Surveying and Scientific Research Institute of Power Systems and Electric Power Networks), and KALYUZHNYY, V. F., candidate of technical sciences, Moscow City Wired-Radio Network

[Abstract] The impedance is analyzed of the conductor-ground circuit in communications cable lines, with allowance made for the metal sheathing and the dielectric coating of an underground cable. Analytical formulas are derived for an unbalanced coaxial cable employing a multi-layered structure of the inner conductor, and grounds of infinite or finite dimensions. Formulas are derived for the conductor-ground impedance considering the cable sheathing, and for the impedance of the sheathing and ground connected in parallel, with an allowance made for intermediate layers. The sheathing parameters are found to play a significant role in determining the latter. The paper was presented by the Means of Communication Department (Otdel). Figures 1; references: 5 Russian; 1 Japanese in Russian translation. [296-6900]

UDC: 621.311.1.017

STRUCTURE OF ENERGY LOSSES IN RAIL TRACTION POWER SUPPLY SYSTEMS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 7, Jul 84 (manuscript received 7 Jan 83) pp 43-46

GERMAN, L. A., candidate of technical sciences and BASOV, V. A., engineer, Gorkiy branch, All-Union Correspondence Institute of Rail Transport Engineers

[Abstract] The loss ratio for all types of standard ac traction power substations are generalized as a function of the external power network voltage level and the number and phasing schemes of the traction substations. Thirty different arrangements of traction substations between regional substations are examined. Most of the power lost in an electrical rail traction network is lost to the external power supply system, and is determined by positive phase-sequence currents. Negative phase-sequence currents comprise a smaller portion of the losses. Additional investments to reduce losses should therefore be directed to the external power supply system. The paper was presented by the Department of Electrical Supply of Electrified Railroads. Figures 2; references: 5 Russian.
[296-6900]

UDC: 621.316.9:681.3.06

DETERMINATION OF DISTANCE TO LOCATION OF DAMAGE EMPLOYING DIGITAL METHOD OF MEASURING CURRENTS AND VOLTAGES

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 7, Jul 84 (manuscript received 27 Oct 83) pp 46-49

KOROLYUK, Yu. F., candidate of technical sciences, Siberian Scientific-Research Power Engineering Institute.

[Abstract] A method is proposed for determining the location of damage on an electrical transmission line which can be effectively implemented on a control computer. Damage tracing is performed by comparing the phases of the calculated voltage at the assumed short circuiting point and the reverse-phase sequence current at the measured point. The proposed method requires that the type of short circuiting and affected line phases be determined first. The accuracy of the method is determined by how accurately the currents and voltages are measured and how closely the actual line parameters agree with the calculated parameters. The error of the method is expected not to exceed 5%. Figures 2; references: 3 Russian.
[296-6900]

UDC: 658.26.004.15.001.24

ACHIEVEMENTS OF USSR POWER SYSTEMS IN REDUCING SPECIFIC CONSUMPTION OF ORGANIC FUEL

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 7, Jul 84 (manuscript received 13 Feb 84) pp 58-61

GORSHKOV, A. S., professor, doctor of technical sciences, All-Union Twice Order of Labor Red Banner Heat Engineering Scientific Research Institute imeni F. E. Dzerzhinskiy

[Abstract] Reduction in the consumption of organic fuel by power systems in the USSR is reviewed for the post-war period. It is found that a specific fuel consumption, referred to the amount of energy produced, has dropped significantly since the Great Patriotic War. Other energy production efficiency indicators have improved: the amount of fuel wasted has been reduced, and the specific energy output per unit of fuel consumed has been increased. A considerable part of the great savings belongs to the improved fuel balance structure. Even greater savings have been achieved by structurally improving energy production. Figures 3; tables 1; references: 7 Russian.
[296-6900]

UDC: 621.373.826

CALCULATION OF ENERGY CHARACTERISTICS OF DOUBLE-PASSAGE AMPLIFIER

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 5, May 84 (manuscript received 21 Sep 82) pp 557-564

BETIN, A. A., DYATLOV, A. I., KULAGINA, S. N., KULAGIN, S. V., MILOVSKIY, N. D. and SHERSTOBITOV, V. Ye., Institute of Applied Physics, USSR Academy of Sciences

[Abstract] Amplification of the return waves in a two-level active medium with a uniformly broadened transition line is investigated. The gain, output intensity and efficiency of a double-passage amplifier are computed as a function of the amplifier parameters and the input signal level using an approximation of planar monochromatic waves. It is shown that radiation losses caused by absorption in the matrix of the active substance, or caused by incomplete reflection from the mirror behind the amplifier, result in optimal operating modes of the double-passage amplifier which correspond to a maximum efficiency of intensity of the output radiation. Even a slight reduction in the divergence of the output radiation (by less than a factor of 2) makes it possible by exploiting the wavefront phase conjugation effect to create a more efficient laser system with better radiation power density per unit of solid angle. Figures 5; references: 6 Russian.
[294-6900]

FREQUENCY SHIFTING IN MULTIMODE FIBER OPTIC PHASE MODULATION DEVICES

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 4 Mar 83) pp 955-957

PETRUN'KIN, V. Yu., KOTOV, O. I., and FILIPPOV, V. N., Leningrad Polytechnic Institute imeni M. I. Kalinin

[Abstract] The possibility of shifting the frequency of modulation signals in a multimode light guide by exploiting internal interference phenomena is demonstrated. Two modes of conversion of phase modulation to amplitude modulation in the same multimode light guide are investigated: differential phase modulation and interference between light beams passing through the

light guide and rereflected from its ends. An expression is derived for the amplitude of a differential modulated signal. Phase modulation of coherent radiation in a fiber optic light guide is found to be a parametric process. When two modulators operate simultaneously the spectra of the differential phase modulation and signal echo contain combination frequencies because of the parametric conversion. Parametric frequency conversion is useful for developing heterodyne and frequency multiplexing devices. Figures 2; references 7: 3 Russian, 4 Western.
[304-6900]

UDC: 535.215

EFFICIENCY OF PHOTOELECTRIC CONVERSION OF SHORT RADIATION PULSES

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 24 Apr 83) pp 979-982

RUMYANTSEV, V. D. and SARADZHISHVILI, N. M., Physical-Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences, Leningrad

[Abstract] The capability of AlAs-GaAs strong-current photocells to convert nanosecond light pulses with photocurrent densities of 10-100 A/cm^2 is investigated theoretically and experimentally. The variation in the load voltage-current characteristic is investigated experimentally by irradiating the subject photocells with a Q-modulated ruby laser. The characteristic time of the photocell required for efficient photoelectric conversion of short radiating pulses is determined. It is found that the radiation pulse itself must be close to rectangular in order to avoid losses occurring when the light flux varies. The authors thank V. M. Andreyev for helpful discussions and Zh. I. Alfyërov for attention to the work. Figures 3; references: 5 Russian.
[304-6900]

PULSED NEODYMIUM GLASS LASER SYSTEM FOR INVESTIGATING NONLINEAR OPTICAL PHENOMENA IN GASES

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 28 Jun 83 after revision) pp 879-882

LUKINYKH, V. F., MYSLIVETS, S. A. and SLABKO, V. V., Institute of Physics imeni L. V. Kirenskiy, Siberian Department, USSR Academy of Sciences, Krasnoyarsk

[Abstract] A powerful frequency-tunable neodymium glass laser active mode-locked laser system developed at the Institute of Physics is described. Near-complete mode locking is provided by periodic Q-modulation of the resonator in combination with spectral selection of longitudinal types of oscillation. Preliminary findings from experiments in generating the seventh

harmonic in mercury vapor are cited. The output parameters of the laser satisfy the conditions for experiments on generating higher harmonics of the fundamental radiation. The pulse length of the periodic Q-modulated laser is independent of the spectrum width of the radiation generated in the band extending from several tens to several tenths of a centimeter. The periodic Q-modulation scheme can be used for active mode locking. Figures 3; references 7: 5 Russian, 2 Western.
[304-6900]

UDC: 621.378.325

INFLUENCE OF MODE NOISE SUPPRESSION IN MULTIMODE FIBER OPTIC LIGHT GUIDES

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 25 Feb 83) pp 883-887

PETRUN'KIN, V. Yu., KOTOV, O. I. and FILIPPOV, V. N., Leningrad Polytechnic Institute imeni N. I. Kalinin

[Abstract] The possibility of noise suppression in a fiber optic light guide with a coherent radiation phase modulator in a specified frequency band is demonstrated experimentally. An experimental setup incorporating an LG-78 single mode gas laser and a PF-150-60 fiber optic multimode light guide 5 meters long is described. The noise component spectrum is measured with an SK4-26 spectrum analyzer. Mode noise is viewed as the result of random phase modulation of coherent radiation in the fiber. Conversion occurs by virtue of internal interferometric phenomena. It is shown possible to reduce mode noise in a given spectral band significantly by phase modulation of coherent radiation in a multimode light guide. Figures 5; references 11: 4 Russian, 7 Western.
[304-6900]

UDC: 535.41

NONLINEAR INTERFEROMETRY

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 6 Apr 83) pp 896-904

ALUM, Kh. P., KOVAL'CHUK, Yu. V. and OSTROVSKAYA, G. V., Physical-Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences, Leningrad

[Abstract] A new class of interference methods is described in which the interference pattern is formed by waves with frequencies converted by nonlinear optical methods. The characteristics and capabilities of nonlinear interferometry are examined. The schematic diagrams of nonlinear interferometers are traced and analyzed. The cause for wave distortions during nonlinear conversion are examined. The use of nonlinear dispersion

interferometry for plasma diagnosis is described. Nonlinear dispersion interferometers can also be used to obtain the relief contours of complex objects, including reflecting objects in a dispersive medium, as well as for investigating large deformations in real time. Figures 5; references 13: 7 Russian, 6 Western (1 in Russian translation).
[304-6900]

UDC: 621.382.2.029.65.047

MILLIMETER-BAND GUNN-EFFECT OSCILLATORS (A REVIEW)

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 18 Feb 83) pp 817-829

SKVORTSOVA, N. Ye.

[Abstract] A comprehensive analysis is made of the current status and prospective development of the properties of solid state oscillators designed for the millimeter waveband and different types of oscillators are compared. It is found that for numerous electrical engineering applications, InP Gunn-diodes are highly competitive with other types of solid state oscillators operating in this band. The parameters of GaAs and InP Gunn diodes which were obtained experimentally in worldwide studies are tabulated and compared. The superior parameters that have recently been achieved in the millimeter band indicate a new stage in the development of oscillation sources based on Gunn diodes. Figures 12; tables 7; references 31: 4 Russian, 26 Western. [295-6900]

UDC: 535.42:534

CHARACTERISTICS OF LIGHT DIFFRACTION BY TWO ACOUSTIC WAVES, ONE WITH COMPLEX FREQUENCY COMPOSITION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 5, May 84 (manuscript received 15 Dec 82) pp 866-870

VASIL'YEV, Yu. G.

[Abstract] The paper examines Bragg diffraction of light by two orthogonal acoustical waves, one of which is excited by a complex radio signal, and the other is excited in an elastic medium by an amplitude-modulated signal with complex frequency spectrum. The energy of the incident wave is found to be distributed among two scattered components, the intensity of one of which is proportional to the square of the envelope of the complex signal. The diffraction applied by two orthogonal acoustic waves can be exploited for two-dimensional optical scanning in two-coordinate acousto-optical deflectors, as well as for processing complex radio signals, e.g., extracting their energy-time structure. A method is presented for calculating the wave parameter Q and the length of acousto-optical interaction which can be used to describe the operation of two-coordinate acousto-optical processors for low distortion levels of the diffracted light. Figures 2; references 10: 9 Russian, 1 Western.
[295-6900]

NEW ACTIVITIES, MISCELLANEOUS

THIRD PLENARY SESSION OF CENTRAL ADMINISTRATION OF POWER ENGINEERING AND ELECTRICAL INDUSTRY SCIENTIFIC-TECHNICAL ASSOCIATION IMENI ACADEMICIAN G. M. KRZHIZHANOVSKIY

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 84 p 62

KAZAKOV, A.K.

[Abstract] The Central Administration of the Power Engineering and Electrical Industry Scientific-Technical Association held its third plenary session on 26 October 1983 in Leningrad. Presentations and discussions dealt with progress in the contributions made by the power engineering community and the electrical industry to the national economy of the USSR, with the role of the Association in these developments, with the role and the activities of relevant USSR ministries under the mandate of the CPSU Central Committee, also with problems of energy sources and energy conservation. A special presentation about power developments and trends in the Armenian SSR was made by Academician (ArSSR Academy of Sciences) G. T. Adonts. After adoption of a further agenda for the Association, prizes were awarded to winners of the contest imeni B.Ye. Vedeneyev in the field of hydro power.
[243-2415]

UDC: 538.566

INFLUENCE OF INTERFERENCE ON DIRECTIVITY PATTERN DURING BOUNDARY DETACHMENT OF SURFACE ELECTROMAGNETIC WAVE IN INFRARED BAND

Leningrad ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 54, No 5, May 84 (manuscript received 14 Jun 83) pp 975-979

ZHIZHIN, G. N., KISELEV, S. A., MOSKALEVA, M. A., SILIN, V. I. and YAKOVLEV, V. A., Department of General Physics and Astronomy, USSR Academy of Sciences; Institute of Spectroscopy, Akademgorodok, Moscow Oblast

[Abstract] The interference pattern observed in an experimental setup for studying boundary transformation between bulk radiation and a surface electromagnetic wave is investigated. The intensity distribution between the interference maxima during interference between radiation from the edge

of the metal and a diaphragm above the metal is measured for different distances between the diaphragm and the surface and edge of the metal. Interference between two beams traveling from the diaphragm and from the edge of the metal is studied. The positions of the interference maxima measured experimentally agree with the analytical values. Figures 3; references: 4 Russian.
[304-6900]

UDC: 539.182

APPLICABILITY OF PHASE INTEGRAL METHOD IN PROBLEM OF LINEAR TRANSFORMATION OF WAVES WITH ALLOWANCE FOR ABSORPTION

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 (manuscript received 21 Nov 83) pp 664-667

BELLYUSTIN, N. S., Scientific Research Radio Physics Institute

[Abstract] The applicability of the phase integral method to describe intermode wave transformation is discussed on the basis of exact solution of the field equations. The analysis performed indicates that previous assertions that the phase integral method is not suitable for the problem in interaction of normal waves in a heterogeneous magnetic plasma considering absorption are unfounded. Figures 3; references: 5 Russian.
[294-6900]

FIFTH CONFERENCE OF SOCIALIST COUNTRIES ON LIQUID CRYSTALS

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 5, May 84 pp 556, 612. 627

KOCHAROVSKIY, V. V. and KOCHAROVSKIY, Vl. V.

[Abstract] Reports delivered at the 5th International Conference of Socialist Countries on Liquid Crystals (Odessa, 11-15-1983) are summarized. The topics reported include experimental investigations of critical phenomena in liquid crystals; nonlinear hydrodynamics of liquid crystals; exploitation of the influence of elastic deformations on the optical properties of liquid crystals; orientation of optical nonlinearity of liquid crystals; analysis, conversion and displaying of data in liquid crystal optical devices; fundamental experimental research on the influence of boundary conditions on electrically stimulated deformations in thermo-tropic liquid crystals; methods for synthesizing cyclic polyesters and their metal complexes; electrical and thermal instability of liotropic liquid crystals; and work conducted on smectic and polymer liquid crystals. The next conference is to be held in the GDR in 1985.
[294-6900]

CSO: 1860 -END-